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DRAWINGS & LIST OF SPARE PARTS

Bio Compatible Injection Valve assy	71.0900.300
Injection Valve Assy	71.0900.301
Syringe Dispenser Assy	71.0900.302
Needle unit Assy 920	71.0920.305
Needle Holder Assy	71.0920.307
Tray Drive Motor assy	71.0920.310
Plate Holder Assy	71.0920.315
Keyboard Assy	71.0920.320
Bottom Frame Assy	71.0920.401
Rear Panel Sub Assy	71.0920.402
Sliding Plate Assy	71.0920.405
Cooling	71.0920.840
Feeder grabber	71.0920.850
Feeder Arm Assy	71.0920.851
Feeder Lift Assy	71.0920.852
CPU PCB	71.0920.770
	31.0900.601
Tray PCB	71.0900.610
	31.0900.610
Dispenser PCB	71.0900.611
	31.0900.611
Feeder Lifts PCB	71.0920.612
	31.0920.612
Feeder Rotor PCB	71.0920.613
	31.0920.613
Feeder arm PCB	71.0920.614
	31.0920.614
Needle unit PCB	71.0920.620
	31.0920.620
Flex PCB	71.0900.625
	31.0900.625
Valve unit PCB	71.0900.630
	31.0900.630
Valve unit + ISS + SSV PCB	71.0900.632
	31.0900.632
I/O PCB	71.0900.640
	31.0900.640
RS 232 Interface PCB	71.0900.650
	31.0900.650
Peltier PCB	71.0900.660
	31.0900.660
Backpanel I/O connectors PCB	71.0900.670
	31.0900.670
Keyboard / Display Interface PCB	71.0900.680
	31.0900.680

IMPORTANT NOTICE

This Endurance Service Manual is designed for use by personnel who have had training and are experienced in servicing this type of equipment. Because of the possible hazards to an inexperienced person in servicing this product, as well as the risk of damage to the instrument, we strongly recommend that all servicing be performed by our Field Service Representatives.

In addition, to improve instrument performance, changes have been made to the instrument by us after this Endurance Service Manual was printed. Accordingly, we make no representations or warranties, either express of implied, that the information contained in this Endurance Service Manual is complete or accurate. It is understood that the purchaser must assume all risk in the use of this Manual for the purpose of performing service upon the instrument it covers.

Components of this instrument which are considered user-serviceable are discussed in detail in the instrument's Users Manual.

Spark Holland strongly recommends to use only original Spark Holland spare parts, otherwise we do not guarantee any specification or liabilities.

SAFETY REMINDERS

The following pages summarize cautionary information basic to the safe operation of this instrument. These safety hazards are indexed by page number in order of their appearance in the manual. However, it is strongly recommended that the user reads the entire manual carefully before attempting to service the instrument. In addition, be sure to heed all, **DANGER**, **WARNING**, **CAUTION**, **ATTENTION** and **NOTE** signs and pictograms which are specifically defined as follows:



DANGER:
The "DANGER sign" denotes a hazard. It calls attention to a procedure, practice or the like, which, if not correctly done or adhered to, could results in injury or loss of life.

Do not proceed beyond a "DANGER sign" until the indicated conditions are fully understood and met.



WARNING:
The "WARNING sign" denotes a hazard. It calls attention to a procedure, practice or the like, which, if not correctly done or adhered to, could result in severe injury or damage or destruction of parts or all of the equipment.

Do not proceed beyond a "WARNING sign" until the indicated conditions are fully understood and met.



CAUTION:
The "CAUTION sign" denotes a hazard. It calls attention to a procedure, practice or the like, which, if not correctly done or adhered to, could result in damage or destruction of parts or all of the equipment.

Do not proceed beyond a "CAUTION sign" until the indicated conditions are fully understood and met.



ATTENTION:
The "ATTENTION sign" denotes relevant information.

Read this information first, it might be helpful or necessary before continuing.

NOTE:
The "NOTE sign" denotes additional information.

It provides the user with advises and suggestions to ease the use of the equipment.

ATTENTION:

Observe precautions for handling Electrostatic discharge sensitive devices.

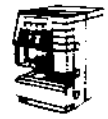
The following safety practices are intended to insure the safe operation of the equipment.

Electrical Hazards

1. Removal of some panels exposes potentially dangerous voltages. Disconnect the instrument from all power sources before removing protective panels.
2. Replace blown fuses with size and rating stipulated on the fuse panel or holder and in the manual where listed.
3. Replace or repair faulty or frayed insulation on power cords.
4. Check actual line voltage to confirm it is the value for which this instrument is wired. Be sure power cords are plugged into correct voltage sources.

General Precautions

1. Perform periodic leak checks on supply lines.
2. Do not allow flammable and/or toxic solvents to accumulate. Follow a regulated, approved waste disposal program. Never dispose of such products through the municipal sewage system.



MECHANICAL SAFETY

Good mechanical safety practices are more important than ever, now that microprocessors are taking control of mechanical devices. Yet, the area of mechanical safety is often overlooked during instrument servicing. We may be able to change this situation if you heed the following safety tips:

1. Remember to keep clothing and fingers away from rotating components. It is easy to slip, lose a tie, or get cut while working near one of these devices.

2. Unless it is absolutely essential, never run mechanical components without the protective guards in place.

3. Always use the tools specifically recommended for the job. This not only reduces the chances of injury, it minimizes damage to the instrument.

4. Although not always possible, it is recommended that mechanical devices should be adjusted or calibrated with the power OFF. This is especially important if you are working with a microprocessor-controlled instrument, which can start running without notice or user-intervention.

5. After the mechanical repairs have been completed, always check that all mounting hardware and safety shields are in place and secure. By doing so you will not only ensure safe operation of the instrument, but may reduce call-backs.

As you can appreciate, all it takes is good common sense, plus good safety techniques that are basic and easy to remember. With this in mind, you should have no trouble servicing mechanical devices safely.

ELECTRICAL SAFETY

It is shocking but true! Many people service instruments without giving much thought to electrical safety. Unfortunately, this can be a dangerous mistake. As electrical/electronic devices are used more widely in modern instrumentation, it means that you may be exposed to more and more potential shock hazards.
It pays to take a few precautions before and during servicing to avoid injury from electrical shock. Here are a few safety tips that can help keep you on the job without a sudden vacation:

1 Avoid standing on damp floors! People have been shocked simply by standing on a damp floor and working on live equipment.

2 Be sure to disconnect the power cord before working on any high voltage circuitry! As power switches disappear from new equipment, this precaution is very easy to overlook.

3 Read and heed ALL caution labels! The are posted for your safety.

4 Take care of your test equipment. Be sure to use the right probes for the right job. Measuring high voltage, for example, requires a well insulated high-voltage probe.
Damaged probes and cables are dangerous and should not be used. Also, be cautious around test equipment like an oscilloscope. The oscilloscope case may become live if you connect the cable ground to a live circuit. Avoid this dangerous situation at all times!

The basic tips regarding good electrical safety practices are easy to remember.
Combined with good common sense, they should keep you on the job for a long time to come.

SPECIFICATIONS

CE



GENERAL

Sound pressure level	LeAq<70 dB
Working temperature	5 - 40°C
Storage temperature	-25 / +60°C
Humidity	20-80% RH
Sample viscosity	0.1 – 5cP
Safety	According to IEC 1010
Sample capacity	1 plate + 4 x 10 ml vials
Titerplate / vials dimensions	Types of plates: 48-vials, 96-low, 96 high, 284-low Maximum total height: 45 mm (including cap) Minimum total height 12.5 mm (including cap) 12 x 8 vials, dimension base plate 128 x 86 mm Maximum outer diameter for each of 48-vials: 12 mm Dimensions 10 ml vials 22 x 45 mm (incl. cap)
Loopvolume	5 – 1000 µL
Plate & height detection	Missing plate & height detection by vial sensor.
Puncturing accuracy needle	+/- 0.5 mm
Pre-puncturing septa/caps	With air needle, dual needle action
Headspace pressure	Built-in compressor
Switching time injection valve	Electrically <100 msec.
Wash solvent	250 ml internal wash solvent bottle
Dispenser syringe	100µL, 250µL (standard), 500µL, 1000µL, or 10 ml
Wetted parts	SS316, PTFE, TEFZEL®, VESPEL®, Glass, Teflon. (Optional: PEEK, Fused silica)

ANALYTICAL PERFORMANCE

Reproducibility	**Capped and sealed vials:**
• Full loop injections	RSD ≤ 0.3%
• Partial loopfill injections	RSD ≤ 0.5% injection volumes >5µL, with headspace pressure on the vial and 30µL pre-flush with air-segment.
• µL pick-up injections	RSD ≤ 1.0% injections > 5µL, with headspace pressure on the vial
	Open vials / plates, valid at 1.0cP:
• Full loop injections	RSD ≤ 0.3%
• Partial loopfill injections	RSD ≤ 0.5% injection volumes >5µL
• µL pick-up injections	RSD ≤ 1.0% injections > 5µL.
Memory effect	< 0.01% with programmable needle wash

PROGRAMMING

Injection methods	Full loop injection Partial loopfill injection µl pick-up injection
Injection volume	5 µL – 1 ml, full loop, depending on system settings 1 µl - 500 µl, with 0.1 µl increments for partial loopfill 1 µl – max. volume, with 0.1 µL increments for µL pick-up. Max. volume = (loop volume – 3 x needle volume)/2
Injections per vial	Max. 9 injections (volumes are programmable for each injection)
Mix methods	
User definable program	
Analysis time	Max. 9 hr 59 min 59 sec
Needle wash	Programmable (between injections, wells or series)
Series	24 freely programmable series
Priority sample	Freely programmable

PHYSICAL

Dimensions (W x D x H)	280 mm x 400 mm x 440 mm 11.0 ". x 15.7 " x 17.3 "
Weight	23 kg (48 lbs.)

ELECTRICAL

Power requirements	115/230 V_{AC}; +15%/-20%; 50 Hz / 60 Hz; 250 VA
Fuses	For 115 V_{AC}: two 5.0 AT-fuses (slow, ¼" x 1¼", UL/CSA) For 230 V_{AC}: two 2.5 AT-fuses (slow, 5 x 20 mm, IEC 127) All fuses UL listed and CSA-certified

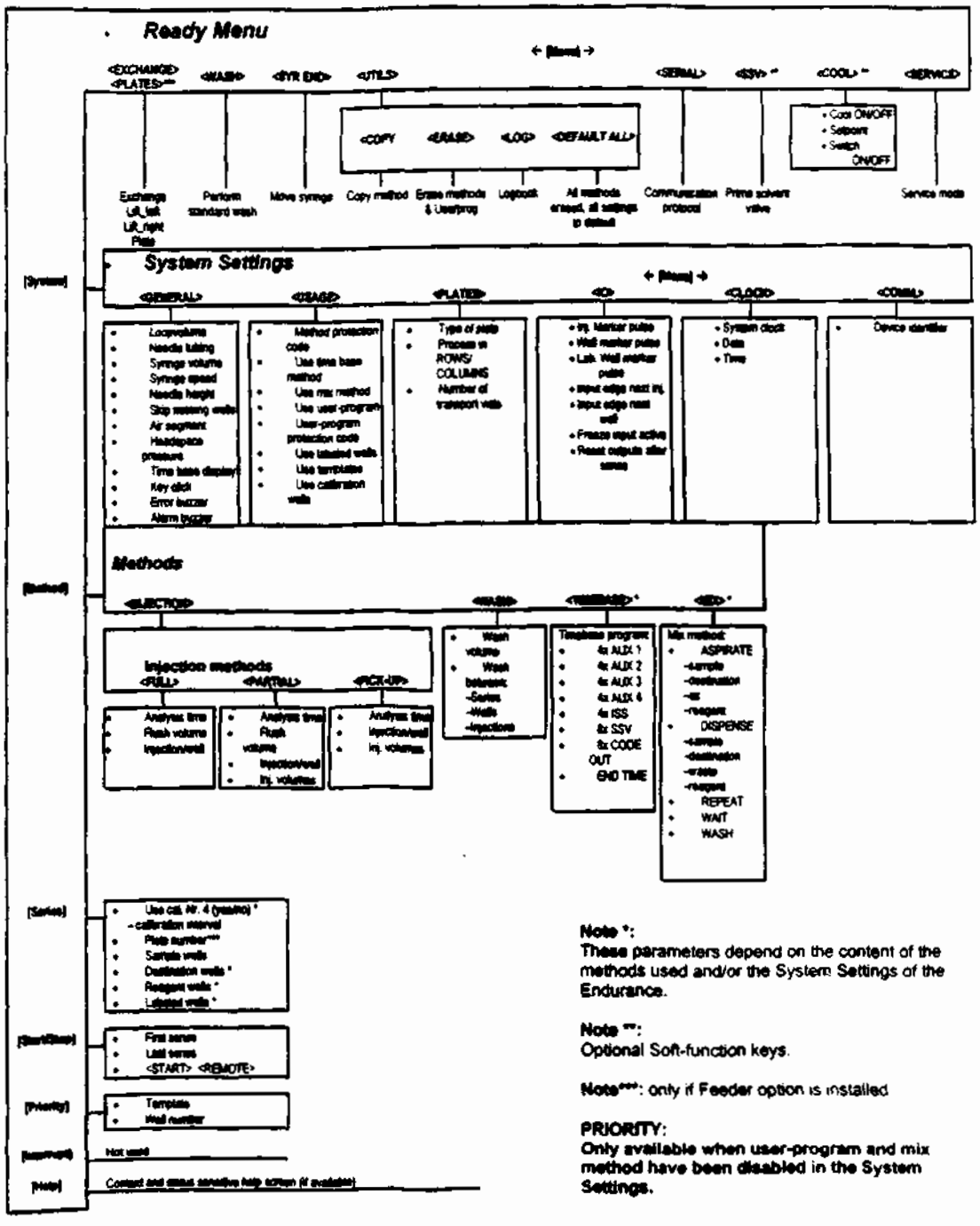
COMMUNICATION

Outputs	Inject marker	(Relay & TTL)
	Well marker	(Relay & TTL)
	Labeled well marker	(Relay & TTL)
	Stop I/O	(Relay & TTL)
	4 Auxiliary outputs	(Relay)
	Alarm output	(Relay)
	2 Programmable outputs	(Relay)
	4 Bit timebase output	(TTL)
Inputs	Next injection input	(TTL)
	Next well input	(TTL)
	Freeze input	(TTL)
	Stop input	(TTL)
	4 Programmable inputs	(TTL)
Serial communication port	RS232C	

OPTIONS *(Factory installed)*

Sample cooling	Built-in Peltier cooling processing unit Range: 4°C – 15°C Cooling capacity: 20°C below ambient. (measured on cooling plate)
Integrated Stream Switching (ISS)	One optional high pressure 6-port Rheodyne 7739 valve
Bio-compatible option	Rheodyne 9740 PEEK injection valve with PEEK sample loop and PEEK sample needle
Biocompatible ISS valve	One optional Rheodyne 9740 PEEK high pressure 6-port valve
Column oven	Mistral column oven combined with the Endurance. The injection valve and optional high pressure valve fit into the column oven compartment.
Solvent selection valve (SSV)	6-way integrated solvent selection valve
Plate feeder	For feeding an additional 6 low plates (96-low; 384-low), or 2 high (96-high) to the Endurance. The feeder is attached to the front of the Endurance. This means an extra 175mm depth added to the Endurance (width 280mm; total depth 575mm)

1 PROGRAGAMMING CHART

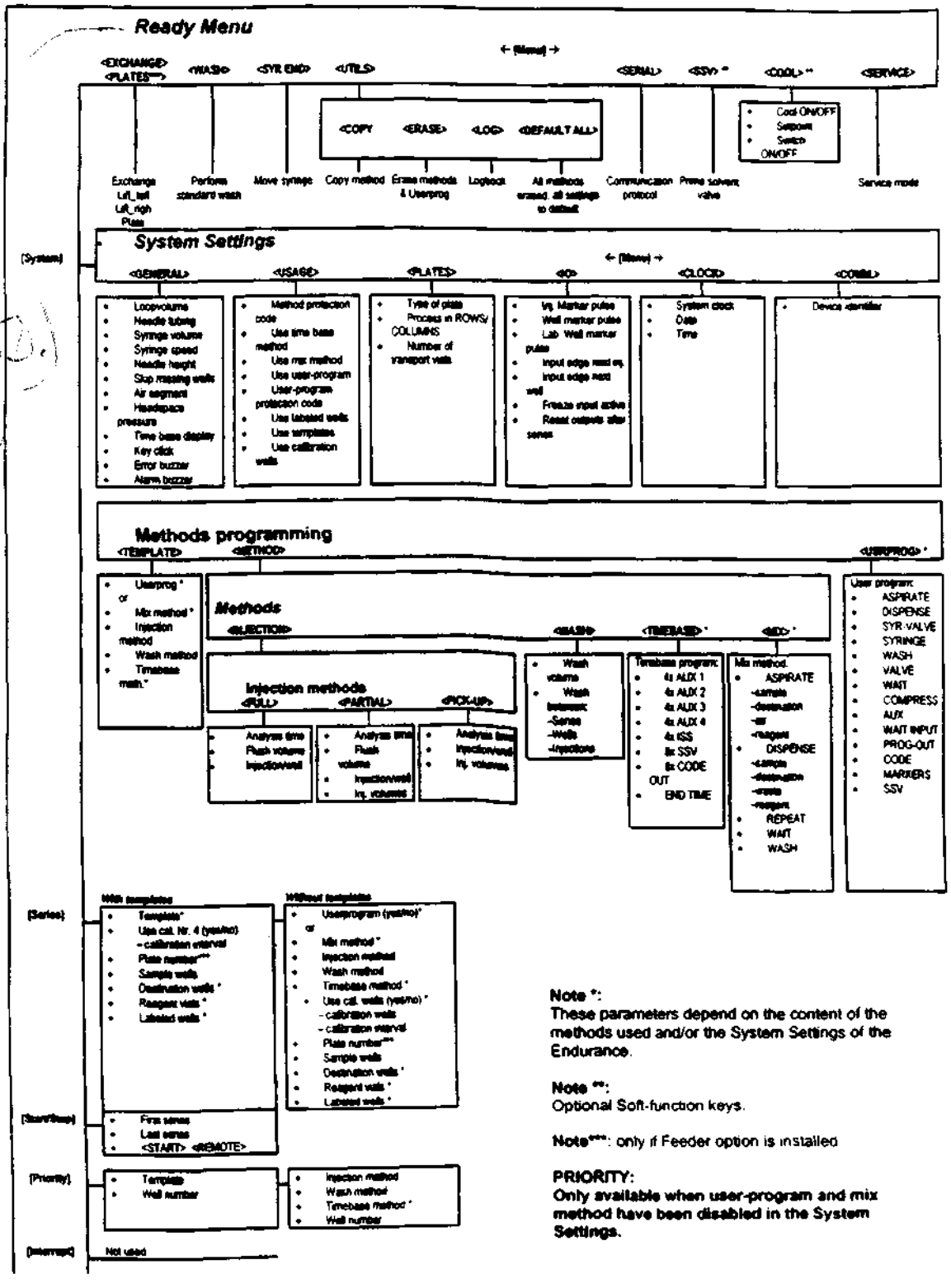


Note *:
These parameters depend on the content of the methods used and/or the System Settings of the Endurance.

Note **:
Optional Soft-function keys.

Note*: only if Feeder option is installed

PRIORITY:
Only available when user-program and mix method have been disabled in the System Settings.



Note *:
These parameters depend on the content of the methods used and/or the System Settings of the Endurance.

Note **:
Optional Soft-function keys.

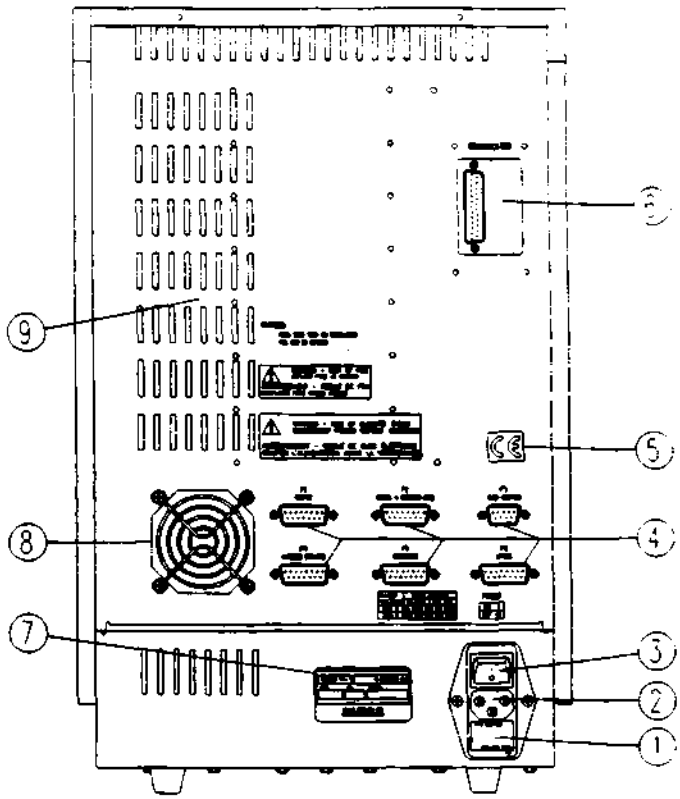
Note*:** only if Feeder option is installed

PRIORITY:
Only available when user-program and mix method have been disabled in the System Settings.

2 CONNECTIONS

The Endurance has six I/O connectors on the rear side; five OUPUT connectors and one INPUT connector.

Rear side of the Endurance



1 Fuses and voltage selector
2 Mains input
3 Mains switch
4 I/O connectors
5 CE-mark
6 Communication interface connector
7 Type label and serial number
8 Fan (only when tray cooling is installed)
9 Ventilate holes



CAUTION:

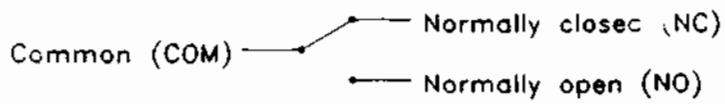
Spark Holland will not accept any liability for damages directly or indirectly caused by connecting this machine to instruments which do not meet relevant safety standards.

2.1 *RELAY OUTPUTS*

Connector **P1** OUTPUTS (Relays)

Pin no.:	Description	Pin no.:	Description
1	OUT 1 – Normally open	9	Spare
2	OUT 1 – Common	10	Alarm output – Normally open
3	OUT 1 – Normally closed	11	Alarm output – Common
4	OUT 2 – Normally open	12	Alarm output – Normally closed
5	OUT 2 – Common	13	24 V DC
6	OUT 2 – Normally closed	14	Power Ground
7	Spare	15	Power Ground
8	Spare	16	

V_{max} = 28 V_{DC} / V_{AC}, I_{max} = 0.25 A



Connector **P4** MARKERS (Relays)

Pin no.:	Description	Pin no.:	Description
1	Inject Marker – Normally open	9	Labeled well marker – Normally closed
2	Inject Marker – Common	10	Stop I/O – Normally open
3	Inject Marker – Normally closed	11	Stop I.O – Common
4	Well Marker – Normally open	12	Stop I/O – Normally closed
5	Well Marker – Common	13	24 V DC
6	Well Marker – Normally closed	14	Power Ground
7	Labeled well marker – Normally open	15	Power Ground
8	Labeled well marker – Common	16	

V_{max} = 28 V_{DC} / V_{AC}, I_{max} = 0.25 A



ATTENTION:

The Relay inject marker contacts are closed/ open during (default) 1 second at the moment the Injection valve switches from LOAD to INJECT.

Connector **P5 AUXILIARIES** (Relays)

Pin no.:	Description	Pin no.:	Description
1	AUX 1 – Normally open	9	AUX 3 – Normally closed
2	AUX 1 – Common	10	AUX 4 – Normally open
3	AUX 1 – Normally closed	11	AUX 4 – Common
4	AUX 2 – Normally open	12	AUX 4 – Normally closed
5	AUX 2 – Common	13	24 V DC
6	AUX 2 – Normally closed	14	Power Ground
7	AUX 3 – Normally open	15	Power Ground
8	AUX 3 – Common	16	

V_{max} = 28 V_{DC} / V_{AC}, I_{max} = 0.25 A



ATTENTION:

Maximum current for 24 V DC supply is 0.5 A total.

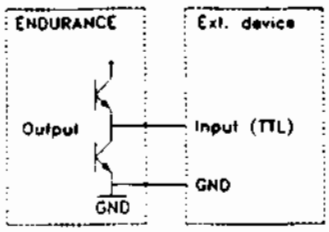


2.2 *TTL OUTPUTS*

Connector **P2** VIAL NO. & MARKERS

Pin no.:	Description	Pin no.:	Description
1	Inject Marker	9	Not used
2	Well Marker	10	Not used
3	Labeled well marker	11	Not used
4	Stop I/O	12	Not used
5	Not used	13	Signal Ground
6	Not used	14	Signal Ground
7	Not used	15	Signal Ground
8	Not used	16	

V_{max} = 5.5 V, logical 1: > 3.5 V_{DC}, logical 0: < 1.0 V_{DC} output source/ sink current ±20 mA



Connector **P3** TIMED OUTPUTS; 4 bit time base code output.

Pin no.:	Description
1	Time base 0 (HEX 1)
2	Time base 1 (HEX 2)
3	Time base 2 (HEX 4)
4	Time base 3 (HEX 8)
5	Not used
6	Signal Ground
7	Signal Ground
8	Signal Ground
9	Signal Ground

V_{max} = 5.5 V, logical 1: > 3.5 V_{DC}, logical 0: < 1.0 V_{DC} output source/ sink current ±20 mA



ATTENTION:

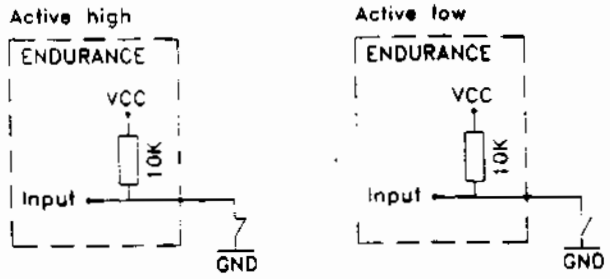
The TTL Inject Marker is an active high contact. The level is high during (default) 1 second at the moment the Injection valve switch from LOAD to INJECT.

2.3 *TTL INPUTS*

The P6 input connector is an active high or active low TTL input, user definable in the System Settings.
The Next Injection input and the Next well input can be used when the endurance works in Remote Control.
The Freeze input and Stop I/O can be used to control the Endurance by other devices.
The four inputs (Input 1 – 4) can only be used in the user program, e.g. to control the sequence of the steps in this method.

Connector **P6** INPUTS (TTL)

Pin no.:	Description	Pin no.:	Description
1	Next injection input	9	Signal Ground
2	Next well input	10	Signal Ground
3	Freeze input	11	Signal Ground
4	Stop I/O	12	Signal Ground
5	INPUT 1	13	Signal Ground
6	INPUT 2	14	Signal Ground
7	INPUT 3	15	Signal Ground
8	INPUT 4	16	





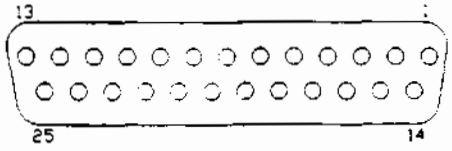
2.4 SERIAL INTERFACE CONNECTOR

The Endurance is standard equipped with a 25 pins D-connector for RS 232 communication.

With the use of the Device Identifier, the address of the Endurance can be selected from 20 to 29
To change the Device Identifier, press: SYSTEM, MENU and <COMM.>

To get access to the serial mode press MENU and <SERIAL>

25 pins D-connector Female



The pin connections of the 25 pins D-connector which are used are as follows:

Pin no.	Description
1	GND (Shield Ground)
2	TXD (Transmit Data)
3	RXD (Receive Data)
4	RTS (Request to Send)
5	CTS (Clear to Send)
7	GND (System Ground)
20	DTR (Data Terminal Ready)

For testing the hardware of the serial port, see chapter 3.9 of this manual.

For serial communication with SparkLink, the following interface cable should be used:

PC side (9-pins female)	Signal	Autosampler (25 pins male)
2	TXD	2
3	RXD	3
5	Ground	7

2.5 *SIGNAL DESCRIPTIONS*

NEXT INJECTION INPUT:

From Ready Menu:

From the Ready Menu a NEXT INJECTION INPUT will start the last programmed series. In this case the Endurance will not wait for the NEXT INJECTION INPUT before continuing with the next injection. The Endurance will execute the complete RUN as it was started with the Start/Stop key.

In Remote control:

This input start the next injection sequence when the Endurance is started in remote control. When the injection sequence is finished the Endurance will wait for the next input.

NEXT WELL INPUT:

Whit the NEXT WELL INPUT the Endurance will perform the next injection from the next well, even if not all injections from that well in the programmed injection have been executed.

FREEZE INPUT:

The Endurance will freeze the analysis time for the time this input is active.
If the FREEZE INPUT is activated while the analysis time is not running, the Endurance will perform all programmed pre-injection sample handling (Mix method, and loading part of the injection method). But the Endurance will wait with injecting the sample until the FREEZE INPUT is no longer active.

STOP I/O:

From Ready screen:

The stop I/O output is low when the Endurance is in the READY screen. The output is high during processing, and when it is forced low the Endurance stops immediately and returns to the READY screen.

In Remote control:

In case of the Endurance is in *remote control mode*, the run of the Endurance is immediately aborted but the Endurance remains in remote control and cannot be re-started with a NEXT INJECTION INPUT.

INPUT 1-4:

Programmable input, can be used in the user program.



3 SERVICE MODE

The software of the Endurance is provided with a service mode.
In the service mode, it is possible to control all the outputs, mechanical movements and to require information from all the inputs.
Since the service mode is only to be used by a qualified service engineer, it is protected by a service code.

To enter the service mode from the "READY" screen, press **[MENU]** followed by the SOFTKEY **<SERVICE>**. After this it is necessary to enter the service code **25 08 96**.

The service mode is set up in such a way that each function of the unit has its own page(s).
To enter a required function press the corresponding softkey.

To enter the service mode proceed as follows:

- Power up the unit

```
16:49 TUESDAY FEBRUARY 02-99    [MENU]
            READY (2.00)

<EXCHANGE> <WASH>  <SYR END> <UTILS>
```

- Press: [MENU]

```
16:49 TUESDAY FEBRUARY 02-99    [MENU]
            READY (2.00)

<SERIAL>                        <SERVICE>
```

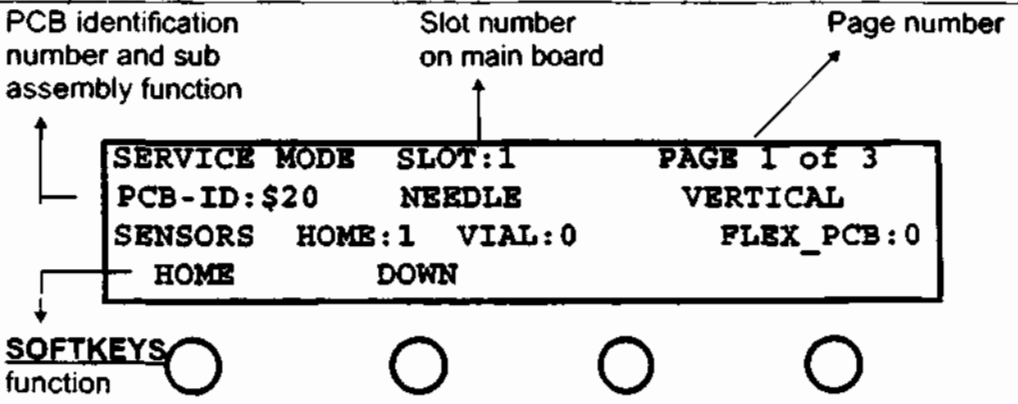
- Press: <SERVICE>

```
ENTER SERVICE CODE,  THEN PRESS ENTER
```

Press: **25 08 96 "E"**

Below is an example of one of the screens in the service mode. Each sub assembly is controlled by its own driver board, which is connected via slots on the CPU board.
Starting with slot number 0 you can step with the "MENU" button on the keypad through all the slots

Sample screen:



	To increase the page number.
	To decrease the page number.
Menu	To move to the next SLOT or to the next main function.
Escape	To leave the service mode.

NOTE:

If during initialization an Error occurs press "Start/Stop" to continue.

NOTE:

After slot 7 there are 3 more main functions (which are only available in the service mode.)

For a description, refer to the End of this chapter.



Although there is no fixed position for the different boards (the software detects the position and the function of the board.)
The factory installation is as follows:

SLOT	PCB-ID	FUNCTION	
0	$60	COOLING	(ONLY IF OPTION IS INSTALLED)
1	$13	FEEDER GRAB	(ONLY IF OPTION IS INSTALLED)
2	$12	FEEDER LIFTS	(ONLY IF OPTION IS INSTALLED)
3	$11	SYRINGE	
4	$20	NEEDLE	
5	$30	VALVE	
or			
5	$3X	VALVE + ISS VALVES + SSV (IF OPTION IS INSTALLED)	
6	$10	TRAY	
7	$40	EXT.I/O	

Dipswitch settings of the multi-functional Valve board

	DIPSWITCH S1				
INSTALLED OPTIONS	**1**	**2**	**3**	**4**	**PCB-ID**
INJ. VALVE	0	0	0	0	$30
INJ. VALVE + ISS A	0	1	0	0	$32
INJ. VALVE + SSV	0	0	0	1	$38
INJ. VALVE + ISS A + SSV	0	1	0	1	$3A

* 0 = OFF
1 = ON

3.1 COOLING PCB (OPTIONAL)

```
SERVICE MODE   SLOT:0          PAGE 1 of 3
PCB-ID:$60     COOLING         SETPOINT: X°C
ACTUAL: X°C $11COUNTS   332mV POWER: -72%
  OFF
```

SETPOINT	:	Can be changed with numeric keypad (range 0 to 40°C)
ACTUAL	:	Current temp of cooling ring
$11COUNTS	:	Output from the AD Converter. (depends on the actual temperature)
332mV	:	Output from cooling ring sensor. (depends on the actual temperature)
POWER	:	Power in % on which the peltiers are working. (-) = cooling (+) = heating

SOFTKEY : To switch the peltiers on or off

```
SERVICE MODE   SLOT:1          PAGE 2 of 3
PCB-ID:$60     COOLING          PSU FAN

  OFF        SLOW       FAST
```

PSU FAN	:	Fan motor on the rear panel of the unit. This fan is only present if the cool-option is installed.

SOFTKEYS

OFF	:	Turns the fan off.
SLOW	:	Will start the fan at half speed.
FAST	:	Will start the fan at high speed.



```
SERVICE MODE   SLOT:1          PAGE 3 0f 3
PCB-ID:$60     COOLING          FAN 1-2

  OFF          SLOW           FAST
```

FAN 1-2 : The 2 fans used to cool the heatsinks below the peltiers.

SOFTKEYS

OFF : Turns the fan off.
SLOW : Will start the fan at half speed.
FAST : Will start the fan at high speed.



NOTE:

The **SOFTKEYS** on page 2 and 3 are overruled if the cooling is turned on (page 1 of 3)

3.2 *FEEDER GRAB* PCB

```
SERVICE MODE   SLOT:1          PAGE 1 of 3
PCB-ID:$13     FEEDER GRAB     VERTICAL
SENSORS   HOME:X    DOWN:X
  HOME          DOWN
```

SENSORS

HOME:X	:	Indicates the status of the feeder grab home sensor.
	= 1	Grab vane is inside home sensor
	= 0	Grab vane is not inside home sensor
DOWN:X	:	Indicates the status of the feeder grab down sensor.
	= 1	Grab vane is inside down sensor.
	= 0	Grab vane is not inside down sensor.

SOFTKEYS

HOME	:	Moves the grab to the home position (upwards)
DOWN	:	Moves the grab downwards.

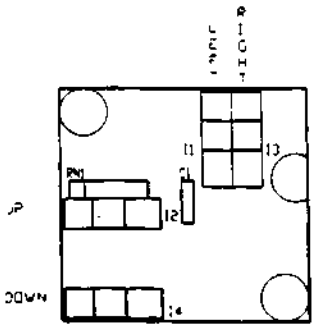
```
SERVICE MODE   SLOT:1          PAGE 2 of 3
PCB-ID:$13     FEEDER GRAB     ROTATE
SENSORS   LEFT:X   RIGHT:X
  PICK          DROP          PLACE
```

SENSORS

LEFT:X	:	Indicates the status of the left grab rotate sensor.
	= 1	Sensor vane is in the left grab rotate sensor.
	= 0	Sensor vane is not in the left grab rotate sensor.
RIGHT:X	:	Indicates the status of the right grab sensor.
	= 1	Sensor vane is in the right grab sensor.
	= 0	Sensor vane is not in the right grab sensor.

SOFTKEYS

		SENSORS LEFT	RIGHT
PICK	Moves the grab in the pick position	1	1
DROP	Moves the grab in the drop position	1	0
PLACE	Moves the grab in the place position	0	1



Grabber arm PCB



```
SERVICE MODE  SLOT:1        PAGE 3 of 3
PCB-ID:$13    FEEDER GRAB   GRAB CLAMPS
GRAB SENSOR:X
  OPEN     CLOSE
```

SENSORS

GRAB SENSOR:X	:	Indicates the status of the feeder grab clamp sensor.
	= 1	Grab clamp vane is inside home sensor
	= 0	Grab clamp vane is not inside home sensor

SOFTKEYS

OPEN	:	Opens the grab clamps
CLOSE	:	Closes the grab clamps

3.3 *FEEDER LIFTS* PCB

```
SERVICE MODE  SLOT:2        PAGE 1 of 2
PCB-ID:$12    FEEDER LIFTS   LIFT RIGHT
SENSORS         HOME:X
  HOME  NEXT-POSITION
```

SENSORS

HOME:X : Indicates the status of the right lift home position.
= 1 Right lift is in the home position.
= 0 Right lift is not in the home position.

SOFTKEYS

HOME : Moves the right lift into the home position.
NEXT-POSITION : Moves the right lift into the next position.

```
SERVICE MODE  SLOT:2        PAGE 2 of 2
PCB-ID:$12    FEEDER LIFTS   LIFT LEFT S
SENSORS         HOME:X  PLATE DETECT:X
  HOME  NEXT-POSITION
```

SENSORS

HOME:X : Indicates the status of the right lift home position.
= 1 Right lift is in the home position.
= 0 Right lift is not in the home position.

SOFTKEYS

HOME : Moves the right lift into the home position.
NEXT-POSITION : Moves the right lift into the next position.



3.4 *SYRINGE PCB*

```
SERVICE MODE   SLOT:2          PAGE 1 of 4
PCB-ID:$11     SYRINGE
SENSORS   HOME:X ROTATION:X
  HOME
```

SENSORS

HOME:X : Indicates the status of the syringe home sensor. This sensor is used to check if the syringe is in the home position.

= 1 Sensor vane is in the home sensor.

= 0 Sensor vane is not in the home sensor.

ROTATION:X : Indicates the status of the rotation sensor. This sensor is used to check if the syringe spindle turns without obstructions.

=1 if rotation vane is inside sensor

=0 if slot of rotation vane inside sensor

SOFTKEYS

HOME : Resets the syringe to the home position.

```
SERVICE MODE   SLOT:2          PAGE 2 of 4
PCB-ID:$11     SYRINGE          LOAD:XXX%
               FREQ START: XXXHz END:XXXXHz
  START
```

PROGRAMMABLE PARAMETERS:

LOAD:XXX% : Enter value how far the syringe to be moved down. (100 % is the full syringe length)

FREQ. START : Enter start frequency for the stepper motor (e.g.: 300 Hz)

END : Enter end frequency (max. speed) for the stepper motor. (e.g.: 5000 Hz)
The maximum speed is 8533 Hz (speed 9 in mix & userprog)

SOFTKEYS

START : Moves the syringe down with the entered parameters for frequency Start, end frequency and the load value.

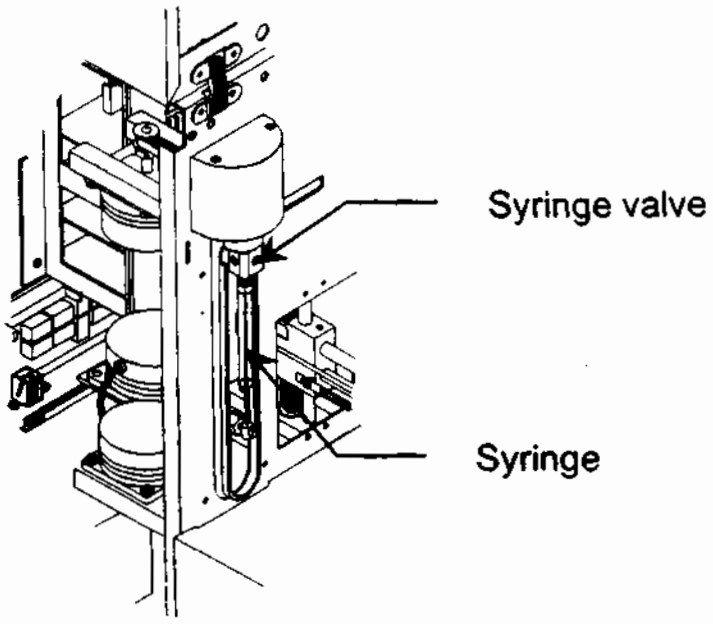
```
SERVICE MODE   SLOT:2          PAGE 3 of 4
PCB-ID:$11     SYRINGE      UNLOAD:XXX%
               FREQ START: XXXHz END:XXXXHz
  START
```

PROGRAMMABLE PARAMETERS:

UNLOAD:XXX%	:	Enter value how far the syringe to be moved up (100 % is the full syringe length)
FREQ. START	:	Enter start frequency for the stepper motor (e.g.: 300 Hz)
END	:	Enter end frequency (max speed) for the stepper motor(e.g.: 5000 Hz)

SOFTKEYS

START	:	Moves the syringe upwards with the entered parameter's for start frequency, end frequency and unload value



```
SERVICE MODE   SLOT:2          PAGE 4 of 4
PCB-ID:$11     SYRINGE          VALVE....
SENSORS LEFT:X RIGHT:X
   WASH       NEEDLE      WASTE
```

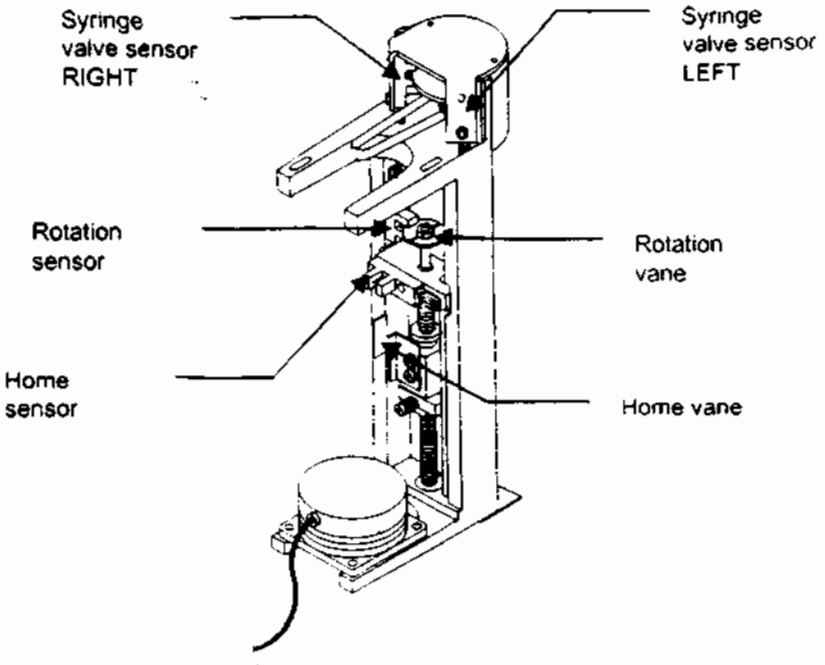
SENSORS

LEFT:X : Indicates the status of the left syringe valve sensor.
- = 1 if rotation vane is inside sensor. (light beam interrupted)
- = 0 if slot of rotation vane is inside sensor

RIGHT:X : Indicates the status of the left syringe valve sensor.
- = 1 if rotation vane is inside sensor. (light beam interrupted)
- = 0 if slot of rotation vane is inside sensor

SOFTKEYS

		SENSORS:	LEFT	RIGHT.
WASH	:	Sets the syringe valve in waste position.	0	1
NEEDLE	:	Sets the syringe valve in needle position.	0	0
WASTE	:	Sets the syringe valve in waste position.	1	0



3.5 NEEDLE PCB

VERTICAL MOVEMENT

```
SERVICE MODE   SLOT:4          PAGE 1 of 4
PCB-ID:$20     NEEDLE           VERTICAL
SENSORS   HOME:X  VIAL:X          FLEX-PCB:X
   HOME        DOWN
```

SENSORS

HOME:X	:	Indicates the status of the vertical home sensor. This sensor is used to check if the needle arm is completely up.
	= 1	if sensor vane is inside sensor
	= 0	if sensor vane is outside sensor
VIAL:X	:	Indicates the status of the vial sensor.
	= 1	if vane is inside sensor
	= 0	if vane is outside sensor
FLEX-PCB	:	To indicate if Flex-PCB is correctly installed.
	= 1	If Flex-PCB is not correctly connected to the Needle PCB.
	= 0	If Flex-PCB is correctly connected to the Needle PCB.

SOFTKEYS

HOME	:	Moves the needle arm to its most upper position.
DOWN	:	Moves the needle arm to its lowest position.



CAUTION:

It is possible to move the needle arm down on every random position. Make sure the needle arm is not obstructed during the down action. Otherwise you might destroy your needles or other parts.



HORIZONTAL NEEDLE MOVEMENT

```
SERVICE MODE   SLOT:4          PAGE 2 of 4
PCB-ID:$20     NEEDLE HOR. SEARCH ROW: X
SENSORS  HOME:X                    FLEX-PCB:X
   START        HOME  WASH/WASTE   ROW
```

SENSORS

HOME:X	:	Indicates the status of the horizontal home sensor. This sensor is used to check if the needle train is completely at the home position.
	= 1	If optical sensor is interrupted by butt strap
	= 0	If optical sensor is not interrupted by butt strap
FLEX-PCB	:	To indicate if Flex-PCB is correctly installed.
	= 1	If Flex-PCB is not correctly connected to the Needle PCB.
	= 0	If Flex-PCB is correctly connected to the Needle PCB.
SEARCH ROW	:	Displays the selected row.

SOFTKEYS

HOME	:	Moves the needle train to its home position.
WASH/WASTE	:	Moves the needle train to the wash/waste position.
ROW	:	Select the next row of the well plate depending on the configured well plate 48 plate: A-F 96 plate: A-H 384 plate: A-P
START	:	Moves the needle train to the programmed row.



ATTENTION:

Before the needle arm might be moved horizontal the following conditions are necessary:

- Vertical home sensor should be 1 (Page 1 of 4)
- Sample needle home sensor should be 1 (Page 3 of 4)

In case the Vertical home sensor is 0 the Endurance will return an Error 34.
If the sample needle home sensor is 0 the Endurance will return an Error 42.

SAMPLE NEEDLE

```
SERVICE MODE   SLOT:4          PAGE 3 of 4
PCB-ID:$20     NEEDLE          SAMPLE NDL
SENSORS   HOME:X  CYCLE:X      FLEX-PCB:X
   HOME        DOWN
```

SENSORS

HOME:X : Indicates the status of the sample needle home sensor.
This sensor is used to check if the sample needle is completely at its home position.(up)
= 1 If sample needle is up
= 0 If sample needle is not completely up.

CYCLE:X : Indicates the status of the cycle sensor
This sensor is used to count the rotation from the sample needle spindle.
= 1 If sensor is interrupted.
= 0 If sensor is not interrupted

SOFTKEYS

HOME : Will move the sample needle to the home position.

DOWN : Will move the sample needle to the lowest position.

```
SERVICE MODE   SLOT:4          PAGE 4 of 4
PCB-ID:$20     NEEDLE          COMPRESSOR
                               FLEX-PCB:X
    ON         OFF
```

SENSORS

There are no sensors used for the compressor.

SOFTKEYS

ON : Turns the compressor ON.

OFF : Turns the compressor OFF.

3.6 *VALVE PCB*

```
SERVICE MODE   SLOT:5          PAGE 1 of 5
PCB-ID:$3X     VALVE           INJECTOR
SENSORS   LOAD:X   INJECT:X
   LOAD       INJECT
```

SENSORS valve position

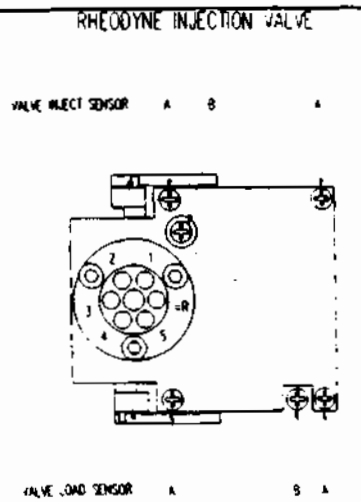
LOAD:X	:	Indicates the status of the load position sensor. This sensor is used to detect the position of the injection valve.
	= 0	Sensor vane is outside sensor
	= 1	Sensor vane is inside sensor, valve is in the LOAD position.
INJECT:X	:	Indicates the status of the inject position sensor. This sensor is used to detect the position from the injection valve.
	= 0	Sensor vane is outside sensor
	= 1	Sensor vane is inside sensor, valve is in the INJECT position.

SOFTKEYS

LOAD	:	Switches the Injector valve to the load position
INJECT	:	Switches the Injector valve to the inject position

NOTE:
The number of pages for the Valve PCB depends on the installed options.

In case of only 1 Valve (injection valve) there is only 1 page.



ISS A

If the ISS A option is installed page 2 is used to control this optional valve.

```
SERVICE MODE  SLOT:5          PAGE 2 of 5
PCB-ID:$3X    VALVE            ISSA
SENSORS  1-2:X  6-1:X
   1-2     6-1
```

SENSORS valve position

1-2:X	:	Indicates the status of the valve sensor. This sensor is used to detect the position of the injection valve.
	= 0	Sensor vane is outside sensor
	= 1	Sensor vane is inside sensor, port 1-2 of the ISS A valve are connected.
1-6:X	:	Indicates the status of the sensor. This sensor is used to detect the position from the ISS A valve.
	= 0	Sensor vane is outside sensor
	= 1	Sensor vane is inside sensor, port 1-6 of the ISS A valve are connected

SOFTKEYS

1-2	:	Switches the ISS A valve to the 1-2 position
1-6	:	Switches the ISS A valve to the 1-6 position



SSV

Page 4 and 5 are used to control the SSV valve.
See below for a description.

```
SERVICE MODE  SLOT:5        PAGE 4 of 5
PCB-ID:$3X    VALVE           SSV
ACTIVE VALVE: X
   <SSV1>   <SSV2>   <SSV3>     <SSV4>
```

ACTIVE VALVE: X : Displays the activated port of the SSV

SOFTKEY

<SSV1> : Opens the SSV port 1
<SSV2> : Opens the SSV port 2
<SSV3> : Opens the SSV port 3
<SSV4> : Opens the SSV port 4

```
SERVICE MODE  SLOT:5        PAGE 5 of 5
PCB-ID:$3X    VALVE           SSV
ACTIVE VALVE: X
   <SSV5>   <SSV6>   <I-LOW>     <I-MAX>
```

ACTIVE VALVE: X : Displays the activated port of the SSV

SOFTKEY

<SSV5> : Opens the SSV port 5
<SSV6> : Opens the SSV port 6

3.7 *TRAY PCB*

```
SERVICE MODE   SLOT:6          PAGE 1 of 2
PCB-ID:$10      TRAY      SEARCH COLUMN: X
SENSORS         HOME:X
  START    HOME        WASTE          WASH
```

SEARCH parameter : A value can be entered to which the tray will search after pressing the SOFTKEY START
In case of a 48 tray: range 1-8
96 tray: range 1-12
384 tray range 1-24

SENSORS

HOME:X : Indicate the status of the home position sensor.
This sensor is used to stop the tray at the home position.
= 0 if sensor is not interrupted by the tray.
= 1 if sensor not interrupted by the tray.

SOFTKEYS

START : After pressing this key the tray will move to the position entered in the search parameter.
HOME : Resets the tray to the home position.
WASTE : Moves the tray to the waste position.
WASH : Moves the tray to the wash position.

```
SERVICE MODE   SLOT:6          PAGE 2 of 2
PCB-ID:$10      TRAY      TRANSPORT/REAGENTS

  VIAL1       VIAL2       VIAL3       VIAL4
```

SOFTKEYS

VIAL1 : Moves the tray to VIAL 1 position.
VIAL2 : Moves the tray to VIAL 2 position.
VIAL3 : Moves the tray to VIAL 3 position.
VIAL4 : Moves the tray to VIAL 4 position.



3.8 *I/O PCB*

```
SERVICE MODE   SLOT:7          PAGE 1 of 10
PCB-ID:$40     EXT. I/O        I CONTROL
I STAT = 0
   ON          OFF
```

I STAT = 0 : Indicates the status from the current limit output circuit

SOFTKEYS

ON : Turns the 24 VDC output on.
OFF : To switch OFF the 24 VDC output

```
SERVICE MODE   SLOT:7          PAGE 2 of 10
PCB-ID:$40     EXT. I/O        INPUTS
NEXT INJ=X   NEXT VIAL=X   FREEZE=X
STOP I/O=X   IN1=X   IN2=X IN3=X   IN4=X
```

Line 3 and 4 provide information on the status from the different inputs.
If **X = 1** the input is **high.**
If **X = 0** the input is **low.**

```
SERVICE MODE   SLOT:7          PAGE 3 of 10
PCB-ID:$40     EXT. I/O        MARKERS

   INJ         VIAL      LABELED
```

SOFTKEYS

INJ : Activate the inject-marker output.
VIAL : Activate the vial-marker output.
LABELED : Activate the labeled vial output.



NOTE:

The duration from these pulses depends on the I/O system settings

```
SERVICE MODE   SLOT:7          PAGE 4 of 10
PCB-ID:$40     EXT. I/O        STOP I/O
STOP I/O = X
   ON          OFF
```

STOP I/O : Indicates the status from the STOP I/O input

If X = 0 the input is low.
If X = 1 the input is high.

SOFTKEYS

ON : Will force the output to a high level.
OFF : Will force the output to a low level.

```
SERVICE MODE   SLOT:7          PAGE 5/6 of 10
PCB-ID:$40     EXT. I/O        AUXILIARIES

  AUX1 ON    AUX1 OFF   AUX2 ON    AUX2 OFF
```

On page 5 and 6 it is possible to control the AUXILIARY outputs by pressing the corresponding **SOFTKEY**.

```
SERVICE MODE   SLOT:7          PAGE 7 of 10
PCB-ID:$40     EXT. I/O        VIAL NO OUTP
NO VIAL NO OUTPUT FOR THIS APPLICATION:
```

Page 7 is not used in this Autosampler.



```
SERVICE MODE   SLOT:7        PAGE 8 of 10
PCB-ID:$40     EXT. I/O      TIMEBASE OUT
                             CODE:00
```

Page 8 is to control the time base output.
After entering a code the corresponding number in BCD will be active on the output.

```
SERVICE MODE   SLOT:7        PAGE 9 of 10
PCB-ID:$40     EXT. I/O      PROG OUTPUTS

   1 ON      1 OFF       2 ON      2 OFF
```

On this page it is possible to control the 2 programmable outputs. These 2 relays outputs are only available in the user's program.

SOFTKEYS

1 ON	:	Will change the status from output one.
1 OFF	:	Will force the output to default value.
2 ON	:	Will change the status from output two.
2 OFF	:	Will force output 2 to default value.

```
SERVICE MODE   SLOT:7        PAGE 10 of 10
PCB-ID:$40     EXT. I/O      PROG OUTPUTS

SPARE ON  SPARE OFF  ALARM ON  ALARM OFF
```

On this page it is possible to control the Spare output and the Alarm output.
The Spare output is not supported by the standard firmware.
The Alarm output is active whenever the unit is stopped by an error.

SOFTKEYS

SPARE ON	:	Will change the status from the Spare output.
SPARE OFF	:	Will force the output to default value.
ALARM ON	:	Will change the status from the alarm output.
ALARM OFF	:	Will force the alarm output to default value.

3.9 *SERIAL PORT TEST*

The screen that follows slot 7 provides a way to check the serial interface. This screen gives also information on the settings from the communication port.
These settings can not be changed.

```
SERVICE MODE  SERIAL PORT   PAGE 1 of 1
PROTOCOL: SPARKLINK    RS232 TEST:   000
9600 BAUD, 8 DATA, NO PARITY, 1 STOP BIT
   START
```

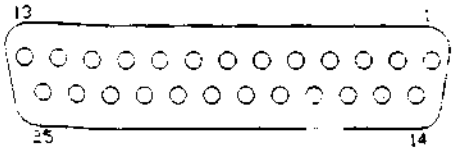
To check the communication port a short circuit should be made between pin number 2 and 3 on the RS 232 connector.
After this connection is made press the Softkey **START**

The Autosampler will sent data out via the TXD and receives the same data back via the RXD, it will compare the send and received data.

If the hardware of the Endurance is working properly the display should show: BUS O.K.
When the hardware is not correct, the display shows: BUS ERROR!

The lay-out of the connector is as follows:

25 pin D-connector Female





3.10 RESET LOG COUNTERS

This function in the service mode is used to reset the LOG counters.
The LOG counters are in the normal operation mode read-only.
Use these reset functions only if the corresponding item is replaced.
Page 4 and 5 are only displayed when feeder option is installed.

```
RESET LOG COUNTERS                PAGE 1 of 5

VALVE UNIT:
    INJ.      ISSA       ISSB        ALL
```

Page 1 is to reset the counters for the injection valves.

```
RESET LOG COUNTERS                PAGE 2 of 5

SYRINGE UNIT:
   VALVE     SYRINGE                   ALL
```

Page 2 is to reset the counters for the syringe system.

```
RESET LOG COUNTERS                PAGE 3 of 5

SYSTEM:
POWER ON TIME
```

Page 3 is to reset the Power on time.

```
RESET LOG COUNTERS                PAGE 4 of 5

LIFT UNIT:
LEFT LIFT  RIGHT LIFT                   ALL
```

Page 4 is to reset the counters of the feeder lift

```
RESET LOG COUNTERS                PAGE 5 of 5

CLAMP UNIT:
  CLAMP    ARM VERT    ROTATION       ALL
```

Page 5 is to reset the counters of the feeder clamp, feeder arm vertical and feeder arm rotation.



NOTE:

It is not possible to erase the EVENT information.

3.11 NEEDLE AND TRAY ADJUSTMENT

This function in the service mode is used to adjust the needle, tray and the exchange position for the feeder option.
Without switching from slot to slot, this feature will allow you to have access to the needle unit functions as well as the tray functions.

```
NEEDLE AND TRAY ADJUSTMENT  PAGE 1 of 6
                TRAY     SEARCH COLUMN: X
SENSORS         HOME:X
   START        HOME       WASTE       WASH
```

SEARCH parameter : A value can be entered to which the tray will search after pressing the SOFTKEY START

SENSORS

HOME:X :
Indicate the status of the home position sensor.
This sensor is used to stop the tray at the home position.
= 0 if sensor is not interrupted by the tray.
= 1 if sensor not interrupted by the tray.

SOFTKEYS

START : After pressing this key the tray will search for the position entered in the search parameter.
HOME : Resets the tray to the home position.
WASTE : Moves the tray to the waste position.
WASH : Moves the tray to the wash position.

```
NEEDLE AND TRAY ADJUSTMENT  PAGE 2 of 6
                TRAY    TRANSPORT/REAGENTS

   VIAL1        VIAL2       VIAL3       VIAL4
```

SOFTKEYS

VIAL1 : Moves the tray to VIAL 1 position.
VIAL2 : Moves the tray to VIAL 2 position.
VIAL3 : Moves the tray to VIAL 3 position.
VIAL4 : Moves the tray to VIAL 4 position.

NEEDLE AND TRAY ADJUSTMENT PAGE 3 of 6			
CALIBRATION EXCHANGE POSITION			
1 STEP=0.086 mm		ALIGN STEPS:-XX STEPS	
EXCHANGE	HOME	UP	DOWN

Align steps:XX — The number of steps from the steppermotor more or less as the default 00 value.

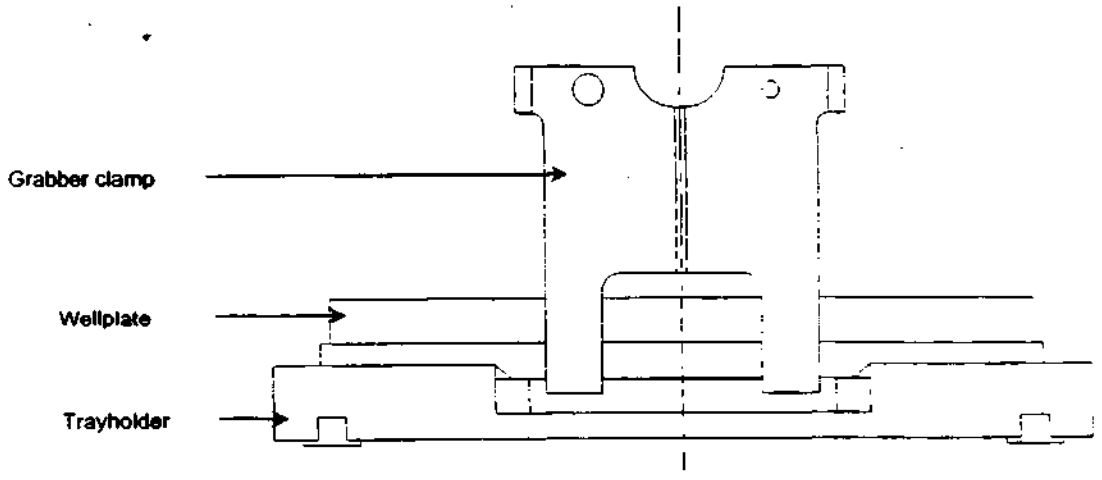
Adjustment procedure:

- Set the tray in the home position
- Move the feeder grabber up (home)
- Open the feeder grab clamps
- Move the feeder grab to the place position
- Move the tray to the exchange position.
- Press the UP or DOWN softkey, to center the stop position of the tray to the feeder grabber clamps.
- Check the position by pressing HOME and EXCHANGE after adjustment

SOFTKEYS

EXCHANGE	:	Moves the tray to the exchange 1 position.
HOME	:	Moves the tray to home position.
UP	:	Increases the number of steps compare to the default 00 value Shifts the exchange position to the left position
DOWN	:	Decreases the number of steps compared to the default 00 position. Shifts the exchange position to the right position.

The maximum and minimum values are +60 steps and –60 steps.
1 step = 0.086mm.
Adjust the exchange position in such a way, the center of the feeder gripper is set in line with the center of the well plate.



```
NEEDLE AND TRAY ADJUSTMENT   PAGE 4 of 6
                  NEEDLE          VERTICAL
SENSORS   HOME:X  VIAL:0        FLEX-PCB:0
   HOME         DOWN
```

SENSORS

HOME:X : Indicates the status of the vertical home sensor. This sensor is used to check if the needle arm is completely up.
- = 1 if sensor vane is inside sensor
- = 0 if sensor vane is outside sensor

VIAL:X : Indicates the status of the vial sensor.
- = 1 if vane is inside sensor
- = 0 if vane is outside sensor

FLEX-PCB : To indicate if Flex-PCB is correctly installed.
- = 1 If Flex-PCB is not correctly connected to the Needle PCB.
- = 0 If Flex-PCB is correctly connected to the Needle PCB.

SOFTKEYS

HOME : Moves the needle arm to its most upper position.

DOWN : Moves the needle arm to its lowest position.



```
NEEDLE AND TRAY ADJUSTMENT  PAGE 5 of 6
                  NEEDLE HOR. SEARCH ROW: A
SENSORS  HOME:1                 FLEX-PCB:0
   START     HOME  WASH/WASTE    ROW
```

SENSORS

HOME:X	:	Indicates the status of the horizontal home sensor. This sensor is used to check if the needle train is completely at the home position.
	= 1	If optical sensor is interrupted by butt strap
	= 0	If optical sensor is not interrupted by butt strap
FLEX-PCB	:	To indicate if Flex-PCB is correctly installed.
	= 1	If Flex-PCB is <u>not</u> correctly connected to the Needle PCB.
	= 0	If Flex-PCB is correctly connected to the Needle PCB.
SEARCH ROW	:	Displays the selected row.

SOFTKEYS

HOME	:	Moves the needle train to its home position.
WASH/WASTE	:	Moves the needle train to the wash/waste position.
ROW	:	Select the next row of the well plate depending on the configured well plate 48 plate: A-F 96 plate: A-H 384 plate: A-P
START	:	Moves the needle train to the programmed row.

```
NEEDLE AND TRAY ADJUSTMENT   PAGE 6 of 6
                   NEEDLE          SAMPLE NDL
SENSORS   HOME:1   CYCLE:1         FLEX-PCB:0
   HOME          DOWN
```

SENSORS

HOME:X	:	Indicates the status of the sample needle home sensor. This sensor is used to check if the sample needle is completely at its home position.(up)
	= 1	If sample needle is up
	= 0	If sample needle is not completely up.
CYCLE:X	:	Indicates the status of the cycle sensor This sensor is used to count the rotation from the sample needle spindle.
	= 1	If sensor is interrupted.
	= 0	If sensor is not interrupted

SOFTKEYS

HOME	:	Will move the sample needle to the home position.
DOWN	:	Will move the sample needle to the lowest position.

4 DISASSEMBLING & ADJUSTMENTS

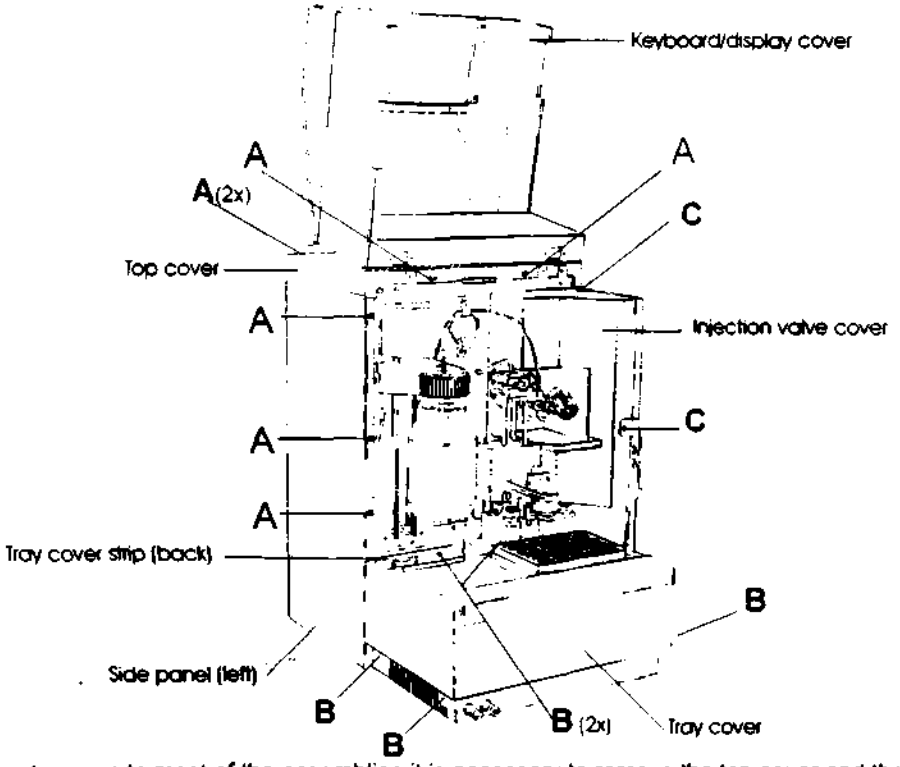
The modular design of the Endurance Autosampler simplifies replacement, reducing repair time and downtime.
This chapter describes how the different assemblies of the Endurance can be removed, repaired, replaced or adjusted.

WARNING

WARNING:

Disconnect Autosampler from AC power source to prevent danger of electrical shock

4.1 REMOVING THE COVERS



To get access to most of the assemblies it is necessary to remove the top cover and the side panels.
For removing the top cover and side panels proceed as follows:

- Remove the 7 screws marked A
- Lift up the top cover and the left side panel.

To get access to the tray drive, cooling assembly and drain tubing's it is necessary to remove the tray cover and the tray cover strip.

For removing the tray cover and strip proceed as follows:

- Loosen the 2 hex screws marked B from the strip, and remove the guiding strip (2 shim's on the back side of the strip protects the screws from falling out, therefore loosen the 2 screws only, instead of removing).
- Remove the 2 hex screws marked B from the tray cover and lift up the tray cover on the left side. Slide the tray cover forwards to remove.

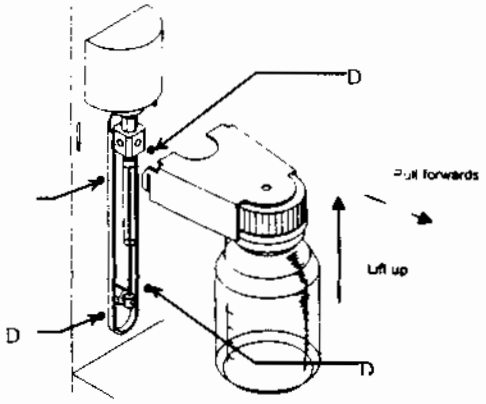
To get access to the injection valve, remove the screws marked C

If a feeder option is installed, see Chapter 5 for removing the feeder cover.

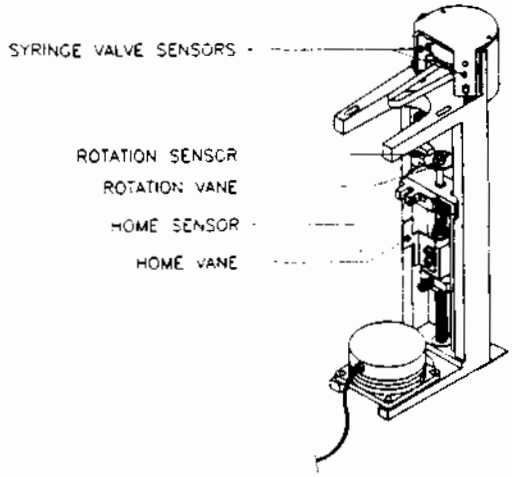
4.2 SYRINGE DISPENSER

For removing the complete syringe dispenser, proceed as follows:

- Remove the top and side panels (see 4.1)
- Remove the solvent bottle (Lift up and pull forwards)
- Remove all the solvent lines from the dispenser valve
- Disconnect the connectors labeled J2-J7 from the Syringe PCB (0900.611)
- Remove the 4 screws marked D.
- It is now possible to remove the complete syringe dispenser assy from the Endurance.

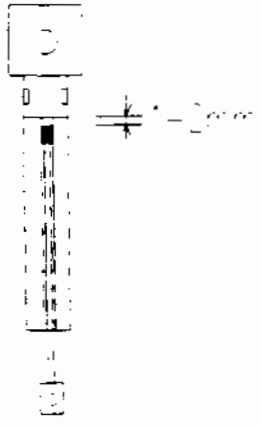


4.2.1 SYRINGE HOME ADJUSTMENT



To adjust the home position of the syringe proceed as follows:

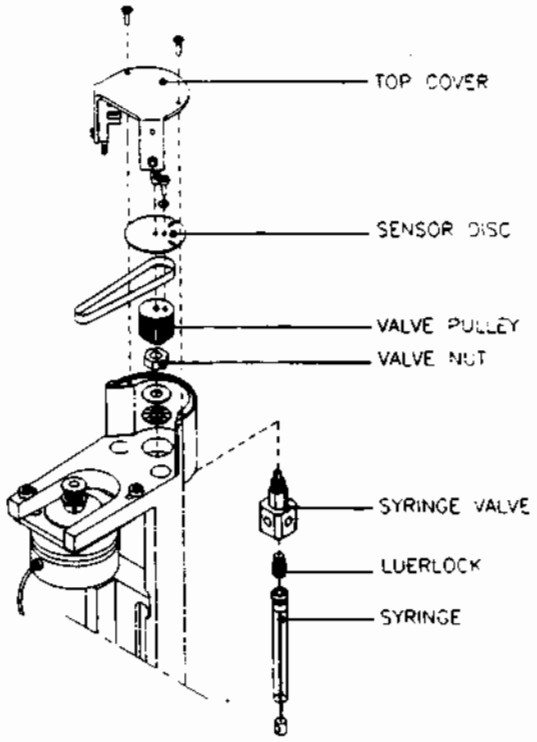
- Check if the syringe is installed correctly. Completely tightened in the luerlock.
- Go to Service Mode concerning Syringe (See section 3.4)
- Loosen the 2 screws that secure the home vane sensor.
- Slide the home vane upwards as far as possible.
- Press the Softkey "HOME".
- Slide the sensor vane downwards approximately 1 mm and press the Softkey "HOME".
- Repeat these two actions until the distance between the tip of the plunger and the end of the syringe is approximately 1-2 mm.
- Tighten the two screws of the sensor vane.



4.2.2 *DISPENSER VALVE*

For replacing the dispenser valve, proceed as follows:

- Remove the entire dispenser assembly, as described in section 4.2.
- Turn the syringe spindle counter clock wise, and remove the syringe.
- Remove the 2 screws from the top cover of the dispenser
- Release belt tension by loosening the steppermotor mounting screws 1 turn and sliding the motor to the valve side.
- Remove the Top cover of the dispenser by lifting it up



- Remove the sensor disc
- Loosen the hex screw from the pulley and lift the pulley up
- Loosen the valve nut and remove the valve downwards

Replace the syringe valve and re-assemble the entire dispenser.
Since the sensor disk takes care of positoning of the valve, there is no initial position for replacing the valve.

NOTE:

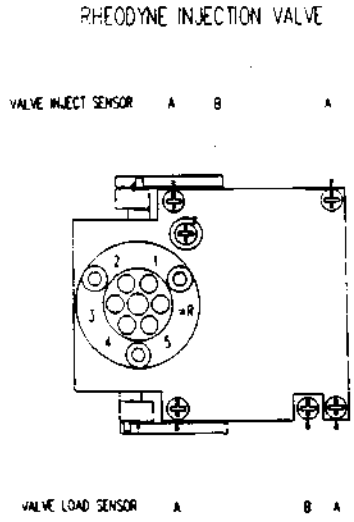
After replacing the syringe valve the LOG COUNTERS for the syringe valve should be RESET.

4.3 INJECTION VALVE

The Endurance Autosampler can be equipped with a Rheodyne Injection Valve as well as with a Valco Injection Valve.
In the next paragraphs both types are described

4.3.1 REPLACING THE COMPLETE INJECTION VALVE ASSEMBLY

Remove the top cover and Side panel left as described in paragraph 4.1
Remove the 2 screws marked C.
Remove all the tubings from the Injection valve.
Remove the leakage protection ring from the Injection Valve.
Slide the injection valve cover forwards.
Note: for some older instruments, the tray cover should also be removed.



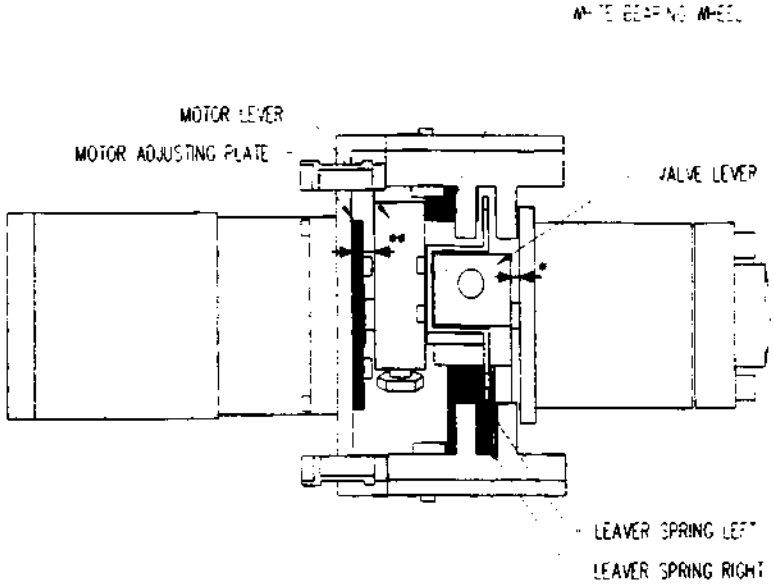
To remove the complete injection valve assembly proceed as follows:

- Remove the injection valve connector J3 from the valve board (0900.63x)
- Remove the connectors from both sensors
- Loose the 2 screws marked B

The entire injection valve assembly can now be removed

To disassemble/replace only the Rheodyne or Valco injection valve proceed as follows:

- Remove the 4 screws marked A
- Remove the injection valve including the mounting plate
- Remove the valve lever from the injection valve



Notes for reassembling:

- Make sure the sensor vane is in-line with the optical sensors.
- Place the injection valve manual in the inject position (sensor vane is inside of the inject sensor)
- Turn the motor lever in the position with the white bearing down (Out of the lever springs!)
- Switch the injection valve manual, by turning the motor lever, for checking on mechanical obstructions.
- Make sure the pressure on the left and right springs are the same, when the rotating wheel of the valve lever inserts into the valve springs.
  If not, readjust the motor to the valve by sliding the complete motor to the left or to the right in order to get the same force on the springs during the movement of the motor lever.
  Loosen the 2 screws of the motor adjusting plate 1 turn and tighten after the adjustment is set.
- In case of a new injection valve motor, the motor adjustment plate should not be removed. Loosen only the 4 screws of the motor.

4.3.2 *MAINTENANCE ON THE VALCO C2-2006/2346 VALVE*

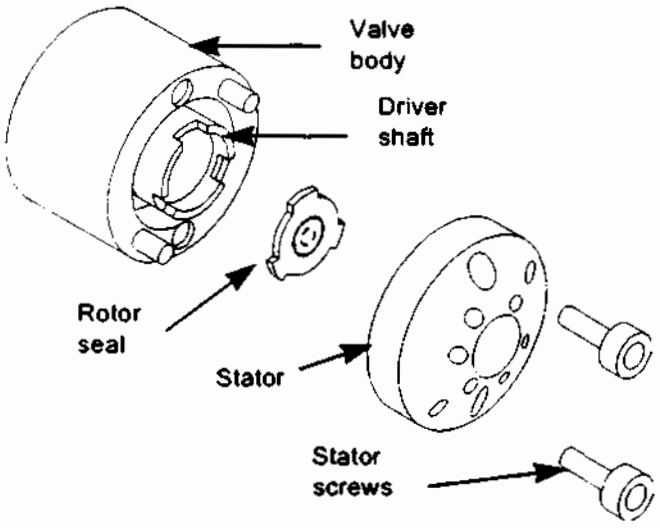
Cleaning a valve can often be accomplished by flushing all lines with appropriate solvents.

NOTE:

Do not disassemble the valve unless system malfunction is definitely isolated to the valve.

Disassembly:

- Use a 9/16 hex driver to remove the socket head screws which secure the cap on the valve.
- To insure that the sealing surface of the cap is not damaged, rest it on the outer face. Or, if the tubing is still connected, leave it suspended by the tubing.
- With your fingers or small tool, gently pry the rotor away from the driver.



- Examine the rotor sealing surface for scratches. If scratches are visible to the naked eye, the rotor must be replaced. If no scratches are visible, clean all the parts thoroughly with an appropriate solvent, taking care that no surfaces get scratched. (The most common problem in HPLC is the formation of buffer crystals, which are usually water-soluble) It is not necessary to dry the rotor.

Reassembly:

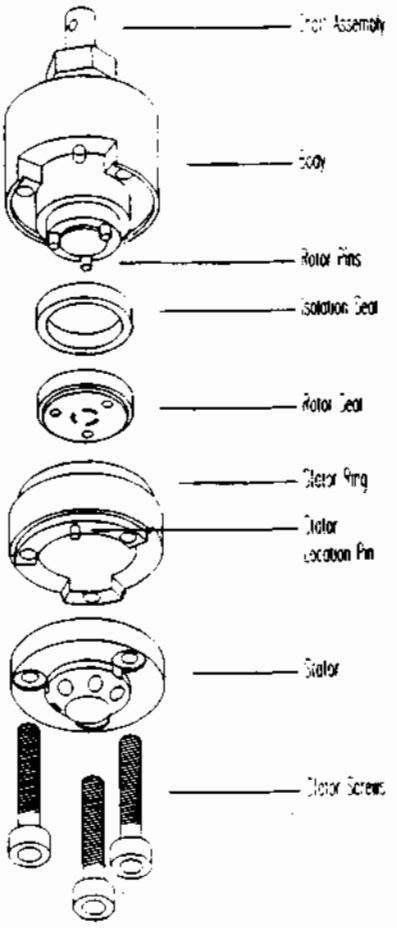
- Replace the rotor in the driver, making sure that the rotor sealing surface with its engraved flow passages is facing out. The pattern is asymmetrical to prevent improper placement.
- Replace the cap. Insert the two socket head screws and tighten them gently until both are snug. *Do not over-tighten them* - the screws simply hold the assembly together and do not affect sealing force, which is automatically set as the screws close the cap against the valve body.
- Test the valve by pressurizing the system. If it does not hold pressure, the valve should be returned to Valco for repair.

4.3.3 *MAITENANCE ON THE RHEODYNE MODEL 7739 VALVE*

With normal use, the valve will give many tens of thousands of cycles without trouble. The main cause of early failure, which is seen as a leak in the valve, is abrasive particles in the sample and/or mobile phase, which can scratch the rotor seal.

Following is the procedure for changing the rotor seal:

- Remove the three stator screws with the 9/16" hex key.
- Remove the stator and stator ring from the valve body.
- Pull the rotor seal off the pins.
- Install the new rotor seal. The three pins on the shaft assembly fit into the mating holes in the rotor seal only one way.
  Mount the seal with the grooves facing the stator.
- Replace the stator ring so that the body locating pin in the stator ring enters the mating hole in the body.
- Mount the stator on the valve so that the stator locating pin in the stator ring enters the mating hole in the stator.
- Replace the three stator screws. Tighten each an equal amount until the screws are tight.



Exploded view of Model 7739.

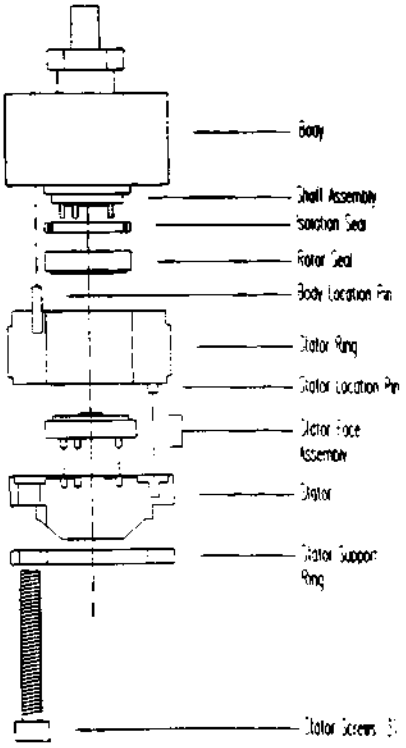
4.3.4 MAITENANCE ON THE RHEODYNE MODEL 9740 VALVE

CAUTION

Use only plastic ferrules in the stator ports. Metal ferrules can cause irreparable damage to the plastic stator.

With normal use the valve will give many tens of thousands of cycles without trouble. The main cause of early failure, which is seen as a leak in the valve, is abrasive particles in the sample and/or mobile phase which can scratch the rotor seal.
Following is the procedure for changing the rotor seal, stator face assembly.

- Remove the three stator screws with a 9/64 inch hex key.
- Remove the stator, st[illegible]r face assem[illegible]d stator ring from the valve body.
- Pull the rotor seal off the pins.
- Mount the new rotor seal. The three pins on the shaft assembly fit into the mating holes in the rotor seal only one way. Mount the seal with the grooves facing the stator.
- Replace the stator ring so that the body locating pin in the stator ring enters the mating hole in the body.
- Put the new stator face assembly on the stator. The three pins on the assembly fit the mating holes in the stator only one way.
- Mount the stator and stator face assembly on the valve so the stator locating pin in the stator ring enters the mating hole in the stator.
- Replace the three stator screws. Tighten each an equal amount until the screws are tight.

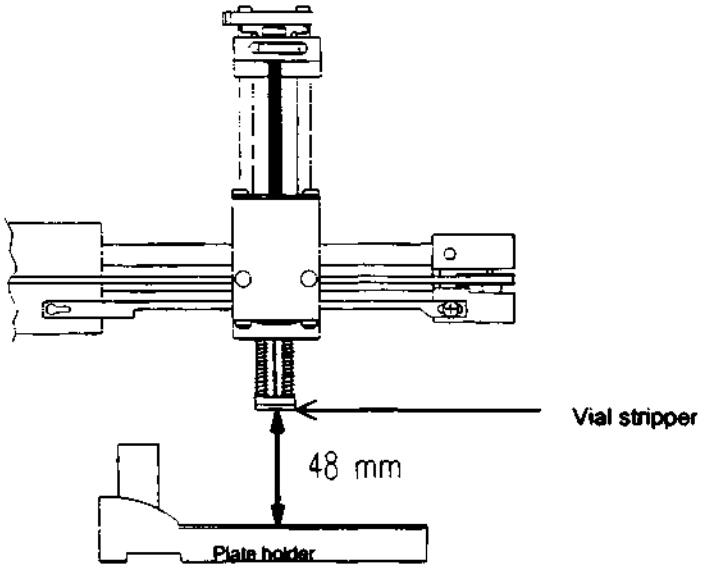


Exploded view of Model 9740

4.4 NEEDLE UNIT ADJUSTMENT

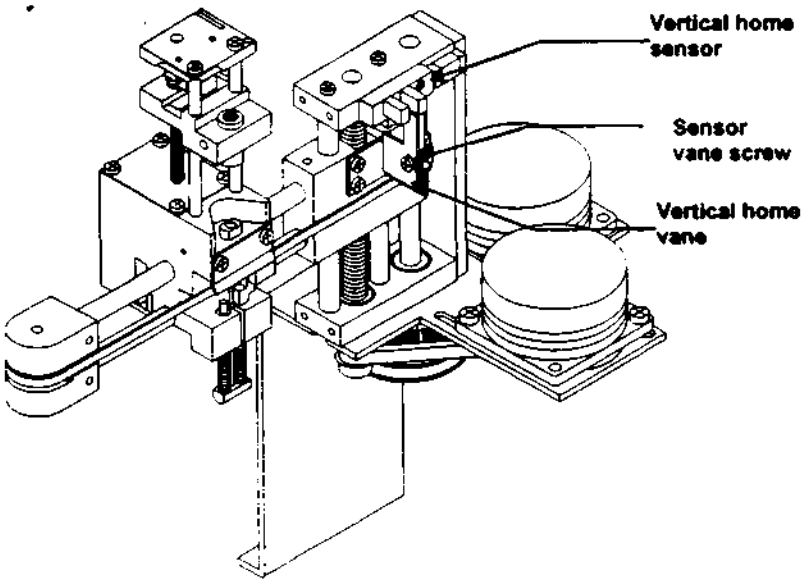
The Needle unit of the Endurance can be adjusted vertical and horizontal. In this paragraph the stop position of the tray holder is also described.

4.4.1 VERTICAL NEEDLE MOVEMENT ADJUSTMENT



The distance between the vial stripper and the top of the plate holder should be 48 mm.

The vertical home sensor determines the home position of the vertical needle movement.
The vertical home sensor vane makes it possible to adjust this height.
Loose the screw one turn and slide the vane upwards if the distance between the vial stripper and the top of the plate holder is < 48 mm.
If the distance is >48 mm slide the vane downwards.
Re-initialize the instrument by turning the main power off and on.

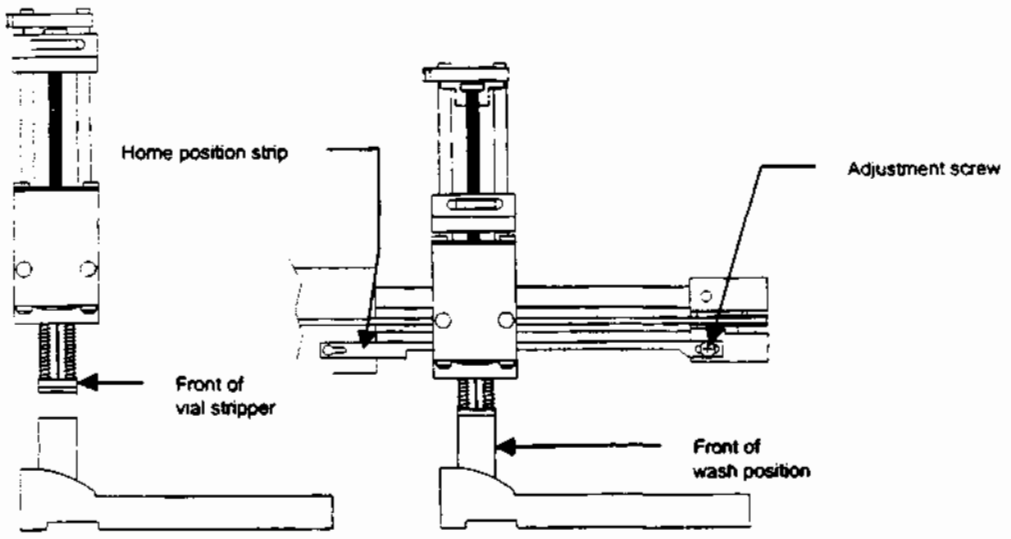


4.4.2 *HORIZONTAL NEEDLE ADJUSTMENT*

A stepper motor controls the horizontal needle movement. The home position is fixed by the home sensor and the home position strip.

The horizontal needle unit movement can be adjusted by sliding the home position strip forwards or backwards.

The front of the vial stripper should be set in-line with the front of the wash position block.



Adjustment procedure:

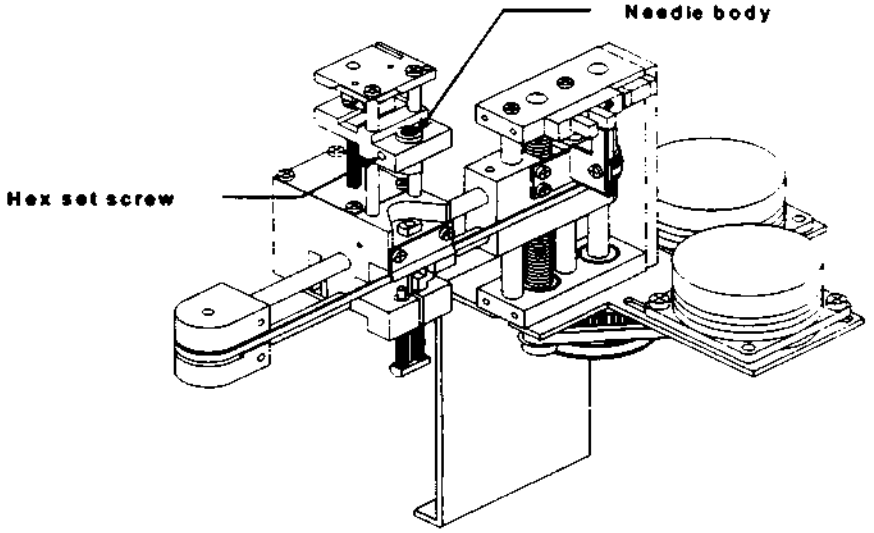
- Use the service mode for tray and needle unit control.
  (Needle and Tray adjustment: Section 3.11)
- Set the tray holder in the wash or waste position (Tray: page 1 of 6)
- Set the needle arm above the wash/waste position (Needle horizontal: page 5 of 6)
- Move the needle arm downwards (Needle vertical: page 4 of 6)
- Check if the front of the vial stripper is in-line with the front of the wash position.
- If not:
  - loosen the marked adjustment screw
  - slide the home position strip forwards in case the vial stripper should adjusted forwards.
  - slide the home position strip backwards in case the vial stripper should adjusted backwards.
  - tighten the adjustment screw
- Move the needle arm upwards (Needle vertical: page 4 of 6)
- Return the needle arm to the home position horizontal (Needle horizontal: page 5 of 6)
- Move the needle arm above the wash/waste position (Needle horizontal: page 5 of 5)
- Move the needle arm downwards (Needle vertical: page 4 of 6)
- Check the position and repeat the adjustment if necessary.

4.4.3 *SAMPLE NEEDLE HEIGHT ADJUSTMENT*

ATTENTION:

The default needle height system setting is 05 mm

To adjust the needle height, proceed as follows:

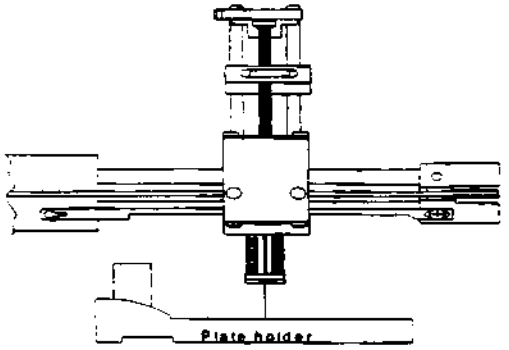


- Set the needle body of the needle unit as high as possible, by loosing the hex screw and sliding the needle body upwards.
- Program the needle height in the system settings to 00 mm.
- Go to the Service Mode and step with the "Menu" key to the Needle unit PCB
- Move the needle unit horizontal above the tray holder with page 2 of 4

ATTENTION:

Remove any object, wellplate of vial adapter from the plate holder

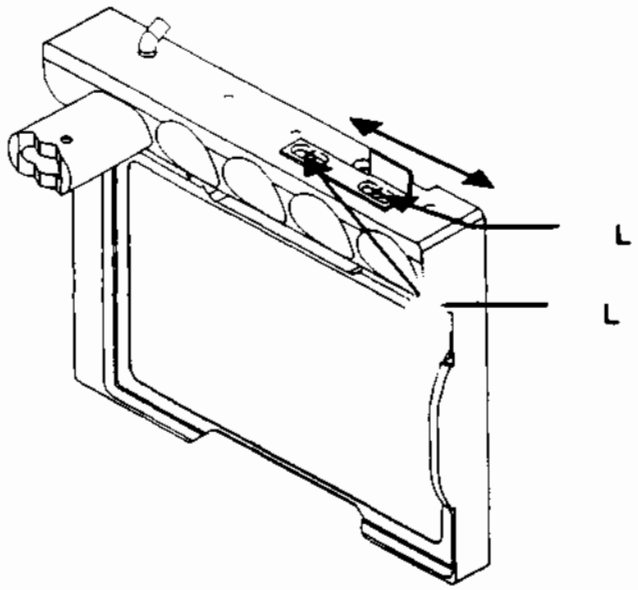
- Move the needle unit down with page 1 of 4
- Move the sample needle down with page 3 of 4
- Slide the needle body downwards until the sample needle just hits the plate holder.
- Tighten the hex screw of the needle body and leave the Service Mode.



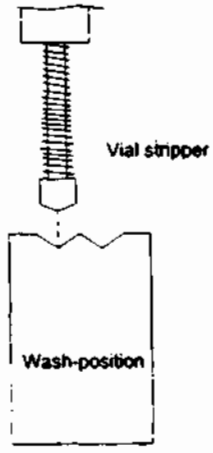
Reset the needle height to 05 mm in the SYSTEM SETTINGS

4.4.4 TRAY HOLDER ADJUSTMENT (LEFT-RIGHT)

The sensor vane of the plate holder can be slided to the left or to the right, to change the stop position of the plate holder.



Loosen the screws marked L ½ turn, slide the vane in the correct position and tighten the screws marked L.
It should be adjusted in such a way that the V-shaped vial stripper of the needle unit is in-line with the V-shaped wash-position block.





CAUTION:

Since the adjustment of the tray holder is done on the tray holder itself, the tray holder "belongs" to the instrument. Therefore do not interchange tray holders on different instruments.

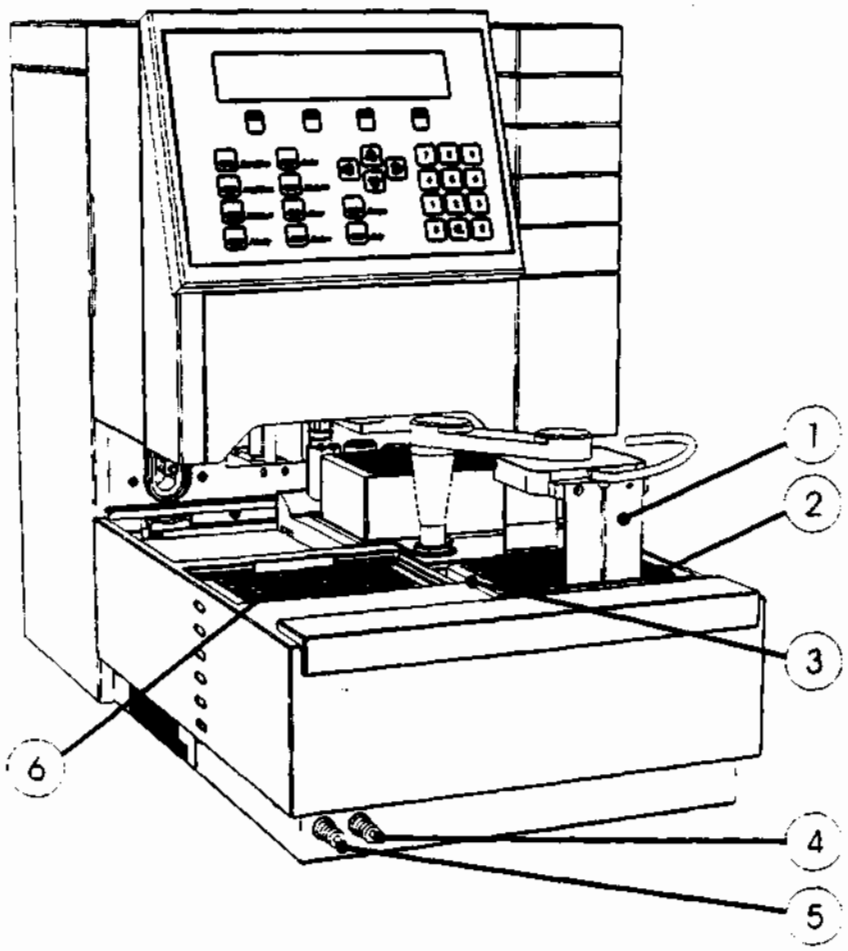
5 FEEDER OPTION

The feeder is a factory-installed option that allows you to feed a maximum of 7 plates of the same type into the Endurance (1 plate on the plate holder and 6 in the right lift of the feeder.)

The following types of plates can be used with the feeder:

- 96-low plates (max. 6 plates in feeder)
- 96-high plates (max. 2 plates in feeder)
- 384-low plates (max. 6 plates in feeder)

The maximum height of plates that can be stacked into the feeder lift is 83.5 mm.



1. Grabber clamps
2. Right lift
3. Plates in right lift
4. Drain wash-position
5. Condensed water and leakage
6. Left lift (storage place for used plates)

Keep in mind that the plate, which is on the plate holder in the Endurance, is number 1, the plates in the right lift are numbered 2 through 7. The uppermost plate in the right lift is number 2.

Make sure there are no plates in the left lift before you start to proceed.

5.1 ADJUSTMENT OF PLATE HEIGHTS

Before operating with a special type of well plate it can be necessary to adjust the h
plate as well as the height of the stacked plates.

The values for the default plates are:
One 96-low plate: 14.5mm
One 384-low plate: 14.5mm
One 96-high plate: 42.0mm
Six stacked 96-low plates: 77mm
Six stacked 384-low plates: 79mm
Two stacked 96-high plates: 82mm

For different height of well plates, proceed as follows:
Program in the system settings <plates> the installed plates.
Return to the main menu by pressing the Escape button twice.

```
16:19 FRIDAY DECEMBER  3-98        [MENU]
            READY (2.01,

<PLATES>   <WASH>   <SYR END>  <UTILS>
```

Select <PLATES>

```
DIRECT CONTROL PLATE HANDLING
            READY (2.01)

<EXCHANGE><LEFT-LIFT><RIGHT-LIFT><PLATE>
```

Select <PLATE>

```
PLATE HEIGHT ADJUSTMENT
PRESS 'HELP' FOR EXPLANATION
PRESS 'E' TO CONTINUE
```

After pressing "Enter" the grabber arm moves to the left lift. (Drop place)
Insert 2 high or 6 low plates in the right lift. (Pick place)

```
DETERMINE HEIGHT OF ALL PLATES


<ADJUST>  <DEFAULT>
```

Select <ADJUST> when the height are different to the default heights.



The adjust screen show the following information.

```
HEIGHT OF ALL PLATES: XX.Xmm


<LIFT-DOWN> <LIFT-UP>
```

Place a ruler or a straight well plate over the top of the right lift.
Press the <LIFT-DOWN> or <LIFT-UP> key until the top of the stacked well plates is in-line with the top of the lift cover.
Now the total height of all the stacked plates are defined.

Press Enter to accept and proceed with the next necessary step.

The right lift moves upwards automatically and the following screen appears.

```
LAST SINGLE PLATE HEIGHT: XX.Xmm
PLEASE LEAVE ONE PLATE IN LIFT

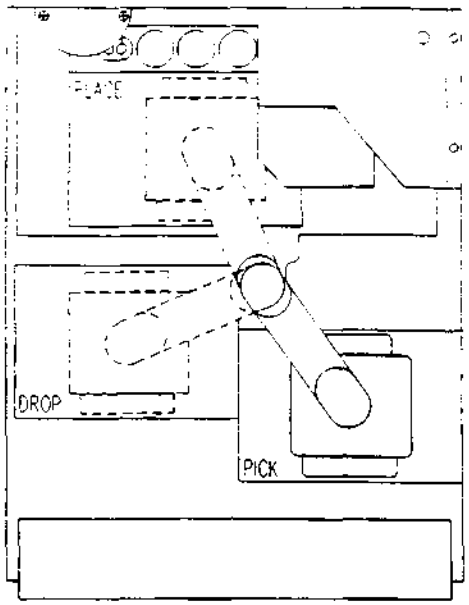
<LIFT-DOWN> <LIFT-UP>
```

Leave only one plate in the lift and place the ruler or straight well plate again over the cover.
Press the <LIFT-DOWN> or <LIFT-UP> key until the top of the stacked well plates is in-line with the top of the lift cover.
The height of one plate is now defined.

Press Enter to accept and the Endurance will return to the direct control plate handling screen.

5.2 ADJUSTMENT OF THE EXCHANGE POSITION

The feeder grabber has 3 positions as shown in the picture below.
The Pick position is the right lift, the DROP position is the left-lift and the PLACE position is on the plate-holder.



In the Service Mode it is possible to adjust the exchange position of the plate holder.
The stop position in the exchange position can be adjusted by increasing or decreasing the number of steps.
To adjust the exchange position, proceed as follows:
Go to the service mode Needle and Tray adjustment pages.(page 3 of 6)

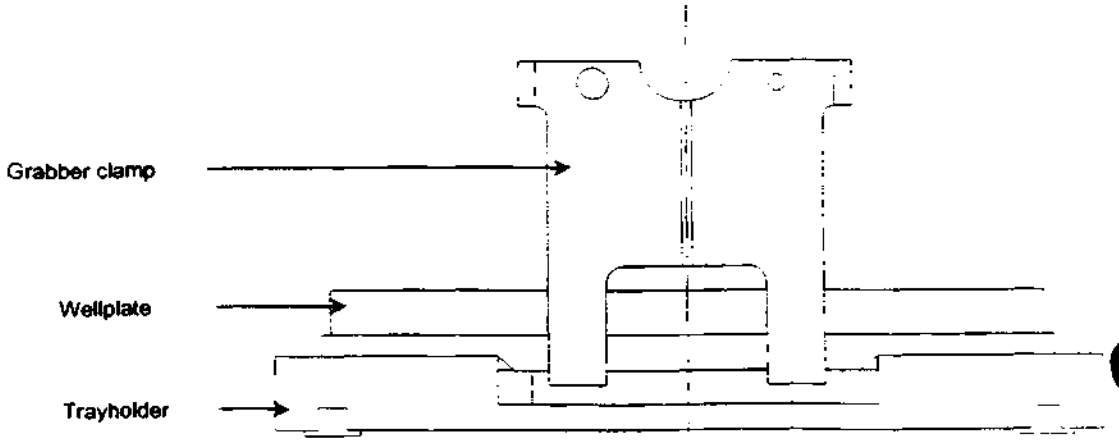
- Set the tray in the home position

Go to the service mode Feeder grab

- Move the feeder grabber to the home position (page 1 of 3)
- Open the feeder grab clamps (page 3 of 3)
- Move the feeder grab to the place position (page 2 of 3)

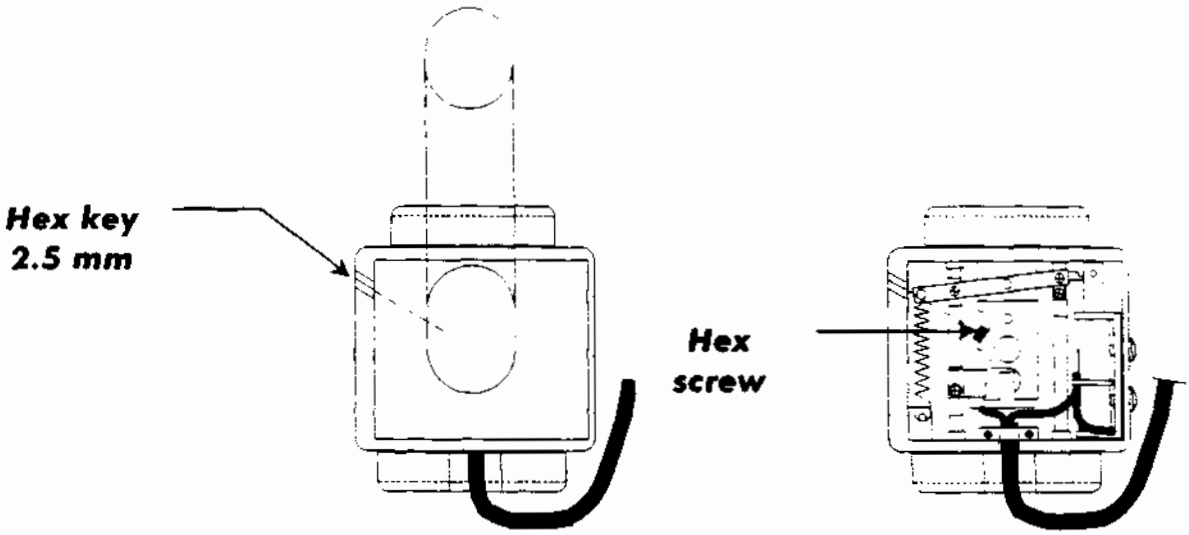
Go to the service mode Needle and Tray adjustment (page 3 of 6)

- Move the tray to the exchange position.
- Press the UP or DOWN softkey, to center the stop position of the tray to the feeder grabber clamps.
- Check the position by pressing HOME and EXCHANGE after adjustment



5.3 GRABBER OPENING

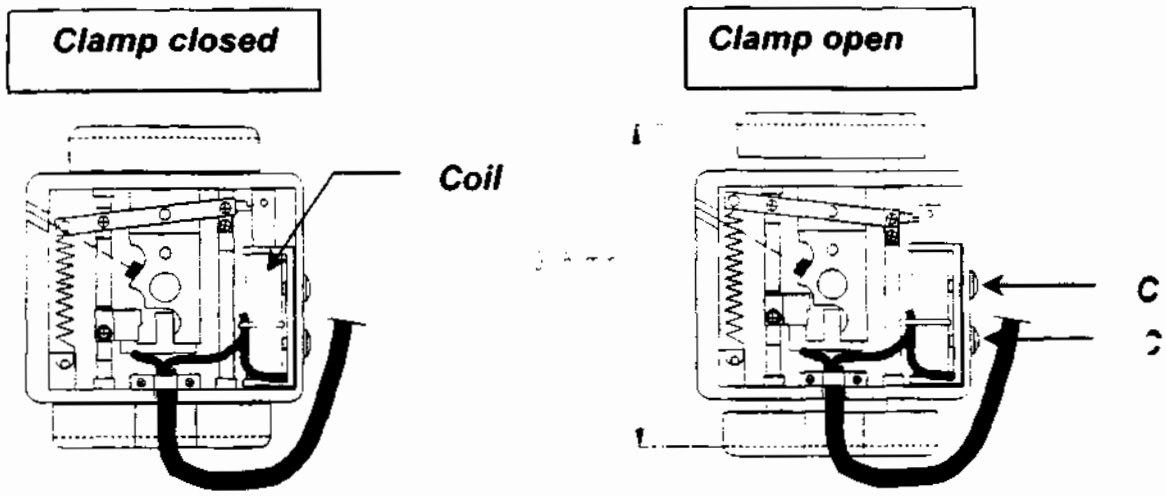
Insert a hex key of 2.5 mm in the grabber and loose the hex screw.
Slide the grabber downwards.
Loose the Philips screw on top of the grabber and remove the grabber cover.



The hex screw which holds the grabber, is also used as Adjustment of the grabber to the feederlifts. The grabber should be set in-line with the feeder lifts, to make sure the grabber will pick-up the well plates on both sides properly.

5.4 CLAMP OPEN/CLOSE ADJUSTMENT

The distance between the grabber clamps can be adjusted by sliding the coil in the grabber frame.



For adjusting, proceed as follows:

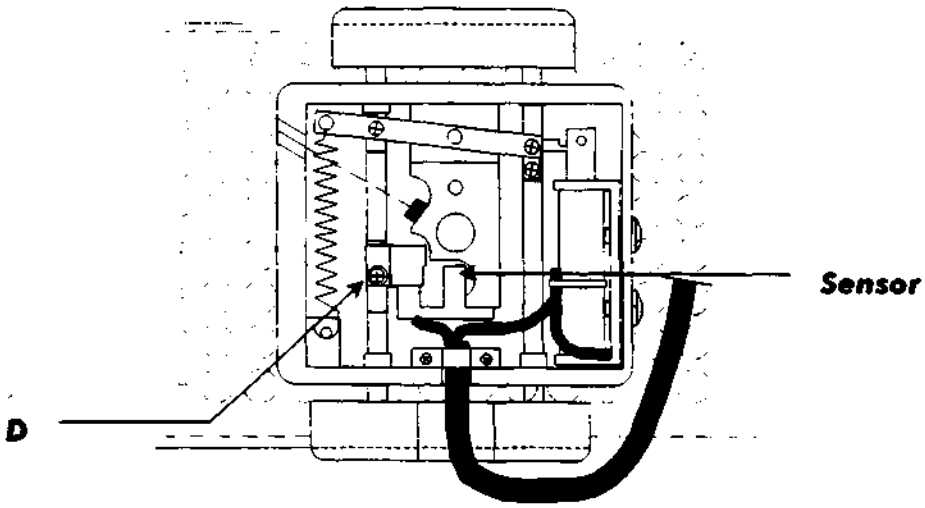
- Open the grabber clamp (use the service mode)
- Loose the hex screws marked C a half turn
- Slide the coil forwards or backward until the position between the grabber clamps is 90.6 mm.
- Tighten the screws C.

5.5 PLATE DETECTION ADJUSTMENT

The plates are detected by an optical sensor, which is placed in the grabber.
It is detecting the open and close position as well as the plates.

Check the status of the sensor in the service mode.
When the clamps are closed without a plate, the status of the sensor should be1.
Clamps are complete open, sensor is: 0
Clamps are closed with well plate between the clamps; sensor is: 0

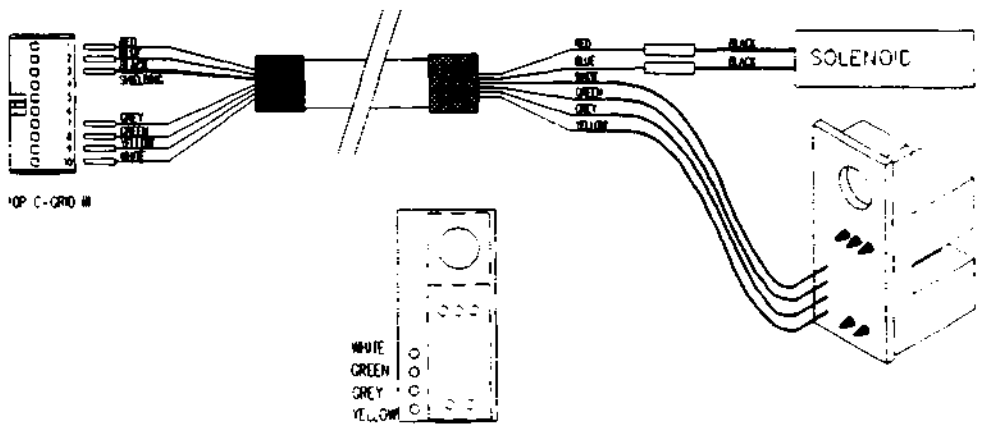
When the plates are not detected, but the open and closed positions are working properly, the sensor should readjusted.



For readjusting the sensor, proceed as follows:

- Open the grabber clamps (use the service mode 3.2)
- Place manual a plate between the grabber clamps
- Loose the screw marked D a half turn
- Slide the sensor flag forwards or backwards to adjust.
- Plate detection: > 84 mm sensor =0
  < 83 mm sensor =1

Grabber cable incl. sensor and solenoid



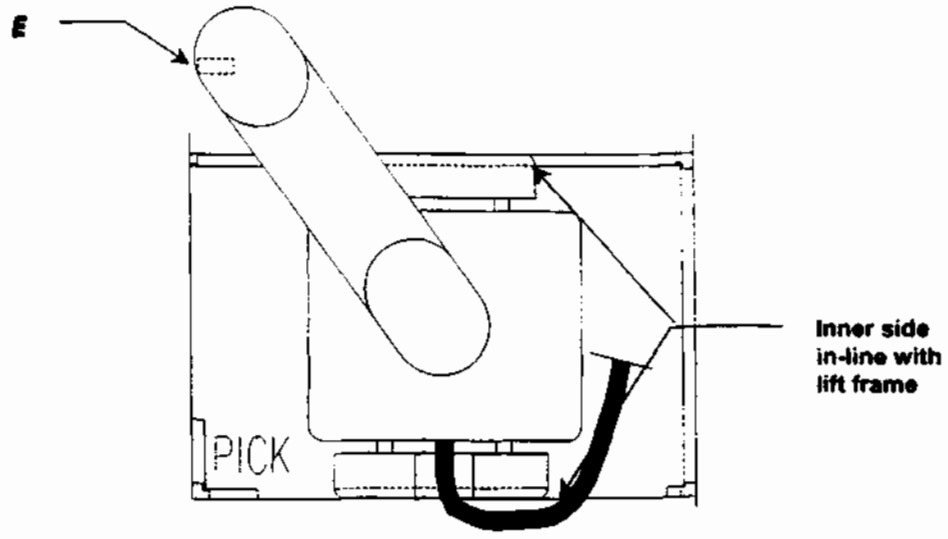
5.6 ADJUSTMENT OF THE STOP POSITION OF THE GRABBER

With the marked screw E, it is possible to adjust the stop position of the grabber.

Make sure the grabber is positioned and aligned above the tray lifts.
Adjust it on the pick-position and check on the drop and place positions.

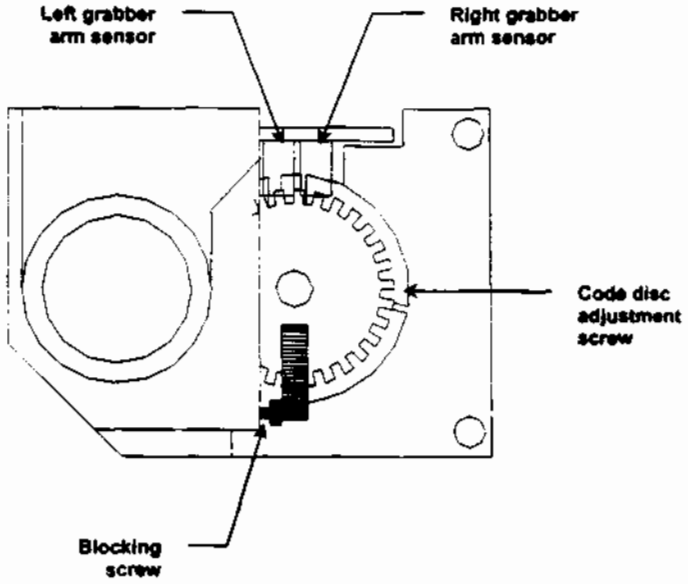
Adjustment procedure:

- Open the grabber clamps (Use Service Mode 3.2)
- Rotate the grabber arm above the pick position.
- Set the grabber arm in the down position.
- Loose the marked screw E one turn and rotate the complete grabber to the left or right position.
- Set the grabber clamps exactly in-line with the lift frame.
- Tighten the screw E after the adjustment is set.



5.7 CODE DISC & BLOCKING SCREW

The feeder arm rotating movement is controlled with an code disc and 2 optical sensors.
There are 3 positions on the disc, the pick drop and place position. (See service mode 3.2)
To ensure the feedarm moves downwards on a correct position, the feederarm is also positioned mechanical with 2 guiding pins below the gearwheel of the feederarm.
Check on the pick, drop and place position for a smooth up and down movement (electronical stop positions are in-line with the mechanical positions)
To align the electronical stop position to the mechanical position, the code disc can be rotated around the gearwheel.



Procedure for adjusting code disc:

- Rotate the feederarm from the drop or place position to the pick position. (See service mode 3.2)
- Move the feeder arm downwards.
- Check for an left-right movement during the downmovement.
- Readjust the code disc, by loosing the hex screw on the shaft of the disc, rotating the disc carefully, and retighten the hex screw.
- Move the feederarm up, rotate the feederarm and check the electronical alignment on all 3 positions.

After readjusting the code disc, it might be necessary to readjust also the blocking screw.
The blocking screw is to prevent the feederarm will rotate the opposite way from the pick position.

Procedure to adjust the blocking screw:

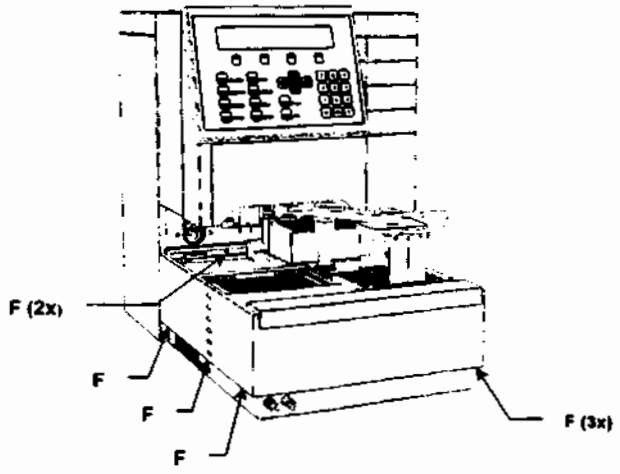
- Rotate the feederarm from the drop or place position to the pick position. (See service mode 3.2)
- Check the status of the optical sensors. Both should be 1 in the pick position.
- Rotate the feederarm furhter as the pick stop positions. Both optical sensors should just stayed 1
- If not, readjust the screw in such a way, both sensors will continued just 1.
- Check if the stop position of the feederarm above the pick position is just before hitting the blocking screw.



ATTENTION:
Check after the adjustments of the code disc and the blocking screw the alignment of the grabber above the lifts as described in chapter 5.6.

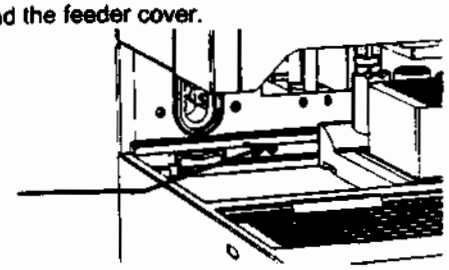
5.8 FEEDER ALIGNMENT

The complete feeder can be aligned with the Endurance by sliding the feeder bottom plate forwards or backwards.
The bottom plate of the feeder is mounted to the Endurance with the 3 screws marked G.

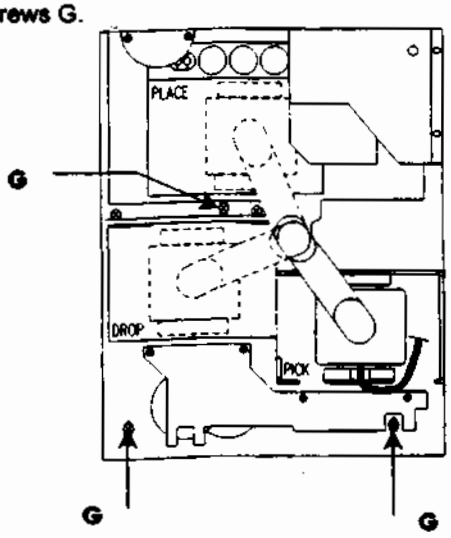


Alignment procedure:

- Remove the cover strip and the feeder cover.



- Loose the 3 screws marked G1 turn
- Slide the complete feeder forwards or backwards tc : the grabber arm in the opened position centered above the tray holder.
- Tighten the 3 screws G.

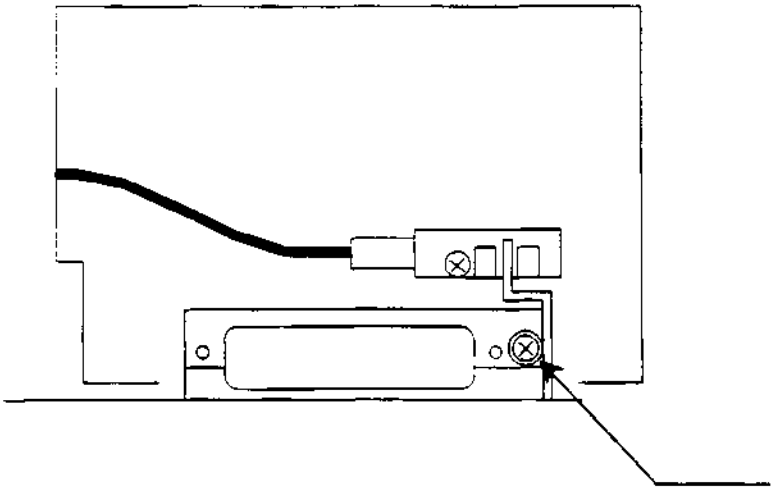


- Re-install the feeder cover and the cover strip

5.9 LIFT HOME HEIGHT ADJUSTMENT

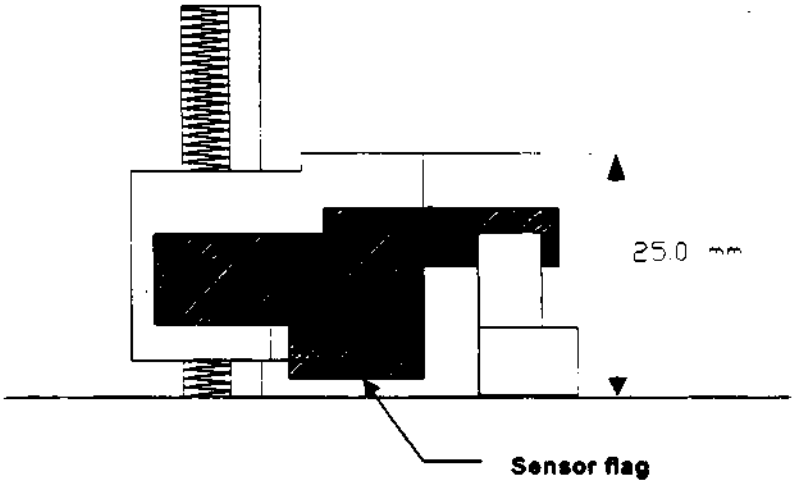
An optical sensor checks the lift home position, which is located at the bottom of the lifts.
During the down movement the sensor flag of the lift will interrupt the optical sensor and stop the lift steppermotor.
From this home sensor, the software will calculating the number of steps necessary to move the lifts to the next positions.

The height of the lift can be adjusted by rotating the lift height adjustment screw, which is located under the liftplate.



To readjust the lift heights proceed as follows:

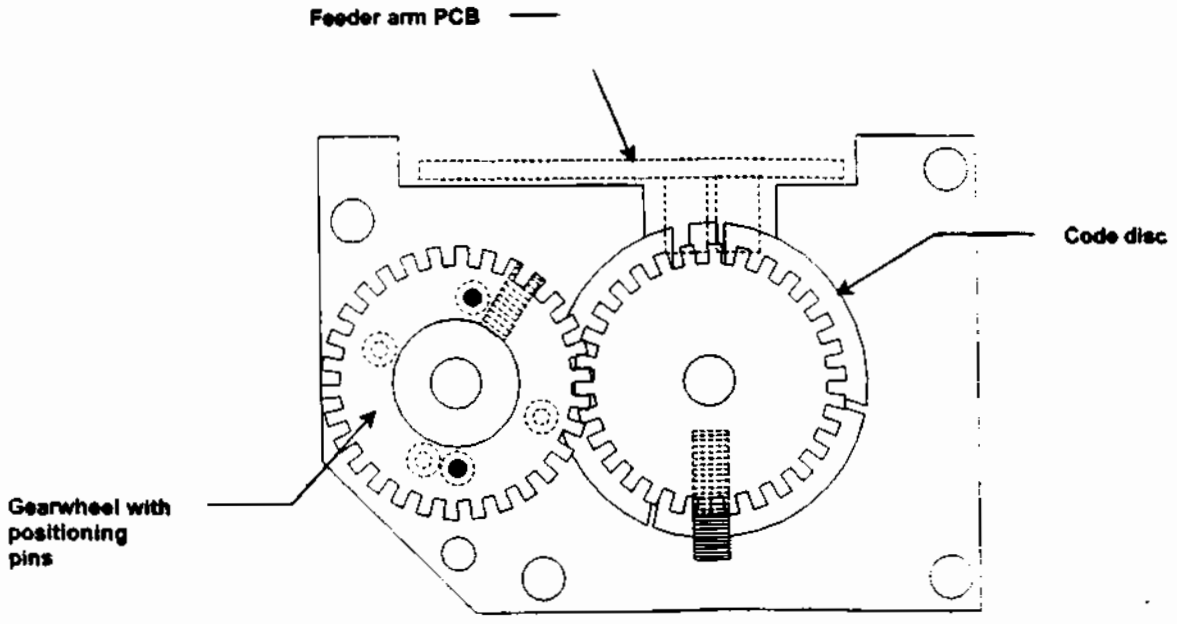
- Remove the liftplates.
- Move down the lifts by using the function <Plates> <Lift home>
- The distance from the top of the lift guiding block to the bottom plate of the feeder should be 25 mm.
- Rotate the lift height adjustment screw clockwise to decrease the distance.
- Rotate the lift height adjustment screws counter clockwise to increase the distance.
- Check the lift heights after readjusting with lift up and home.



5.10 GEARWHEEL ASSEMBLING POSITION

The feeder arm rotating movement is controlled by a steppermotor.
Between the steppermotor and the feeder arm, 2 gearwheels are placed, to ensure the correct stop position of the arm above the pick, drop and place position.

The initial assembling position for the gearwheels should be made according the drawing above to perform the correct rotation positions.
In this situation the right gearwheel with the code disc, is in the pick position and both optical sensors are active.
For adjustment of the code disc, see section 5.7





5.11 TEST PROCEDURE FOR FEEDER OPTION

To test the proper function of the feeder option, the following program can be used.
With this program the feeder will aspirate from one position and dispense in a position on a different well plate. In this situation, the feeder is used without switching the injection valve.

Test procedure for 96 low well plates

Install 6 well plates in the right lift and 1 on the plate holder.

System <USAGE>
Use of mix methods: <ENABLED>

System <PLATES>
Select: <96-LOW>
How to process the wells: <IN ROWS>

Methods:
Method type: <MIX> Number: 01
<INSERT> ASPIRATE 00000.1µL SAMPLE SPEED: 2 HEIGHT: 05mm
<INSERT> DISPENSE 00000.1µL DESTIN SPEED: 3 HEIGHT: 20mm
END of Mix method

Series:
Mix method number: 01
Injection method number: NONE
Wash method number: NONE

First sample:	Plate: 1 Row: A Column: 01
Last sample:	Plate: 4 Row: D Column: 12
First destination:	Plate: 4 Row: E Column: 01

Test procedure for 96 high well plates

Install 2 well plates in the right lift and 1 on the plate holder.

System <USAGE>
Use of mix methods: <ENABLED>

System <PLATES>
Select: <96-HIGH>
How to process the wells: <IN ROWS>

Methods:
Method type: <MIX> Number: 01
<INSERT> ASPIRATE 00000.1µL SAMPLE SPEED: 2 HEIGHT: 05mm
<INSERT> DISPENSE 00000.1µL DESTIN SPEED: 3 HEIGHT: 20mm
END of Mix method

Series:
Mix method number: 01
Injection method number: NONE
Wash method number: NONE

First sample:	Plate: 1 Row: A Column: 01
Last sample:	Plate: 2 Row: D Column: 12
First destination:	Plate: 2 Row: E Column: 01

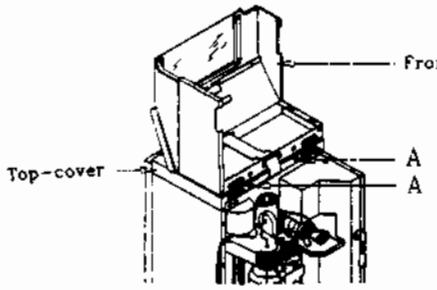
6 FIRMWARE REPLACEMENT

The firmware is stored in an EPROM which is located on the CPU Board.

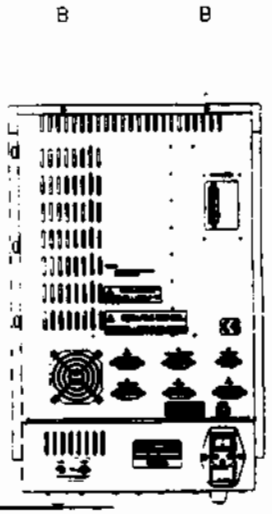
ATTENTION:

The EPROM is highly sensitive for Electro Static Discharges. Observe precautions for handling Electro Static Discharge sensitive devices.

For replacement of this EPROM proceed as follows:



- Make a notice of all the "System Settings" , "Methods" and "Tray Exchange".
- Turn mains power off.
- Open the frontpanel.
- Remove the 2 screws marked A on the front-side.

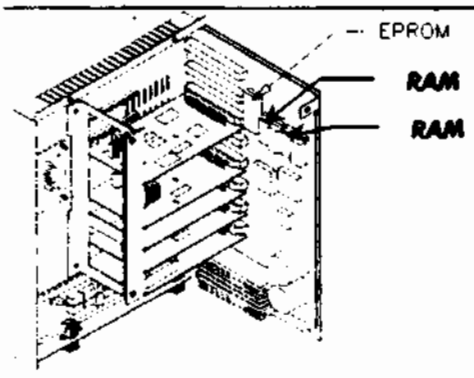


- Remove the 2 screws marked B on the rear-side.
- Close the frontpanel.
- Lift up the top-cover.

NOTE:

If the current firmware of the Endurance is below version 2.00, it is necessary to replace also the 2 marked 8K RAM.

The EPROM shipping box contains also the 2 new 32K RAM.



- Remove the old EPROM, 2x RAM (SEE NOTE) and install the new EPROM and 2x new RAM.
- Replace the top-cover.
- Turn mains power on and reprogram the "System Settings" and "Methods".

NOTE:

The little notch on the top of the EPROM and RAM should be facing the same way as the notch on the IC-socket.



7 TROUBLE SHOOTING

7.1 ERROR CODES

Every malfunction of the ENDURANCE will be reported as an error code. In the list below, each error code is described and also the action to solve the mentioned error is given.

7.1.1 INJECTION VALVE AND ISS VALVE UNIT

ERROR:	*CAUSE:*	*ACTION:*
11	Injection valve is not in a valid position. The output from both the sensors is high (1)	• Check the output from the optical sensors in the service mode
12	The injection valve did not switch within 1.5 sec. It takes more then 1.5 sec. Before the sensor vane leaves the optical sensor	• Check for loosen parts • Check the DC motor • Check optical sensors
13	The switching time of the injection valve exceeds 500 msec.	• Check rotor seal and stator (Torque to turn the valve might increased dramatically.) • Check the motor and valve levers • Check the DC-motor
14	ISS A Valve is not in a valid position	See ERROR 11
15	The ISS Valve A did not switch within 1.5 sec.	See ERROR 12

7.1.2 SYRINGE DISPENSER UNIT

ERROR:	*CAUSE:*	*ACTION:*
21	The syringe valve does not switch. The output code from the two sensors does not correspond to the software settings.	• Check the two sensors in the service mode (turn the valve by hand using the valve sensor disc as a grip) • Check the stepper motor • Check the belt tension • Check for loosen parts
22	The syringe did not reach the home position in time. The spindle rotates correct, but the syringe never reaches its home position	• Check screw tread in transport block assy, if worn out replace transport block spindle assy • Check home sensor in Service mode
23	The syringe spindle did not make the correct number of rotations. The number of pulses created by the rotation sensor does not correspond with the number of steps send to the stepper motor.	• Remove syringe • If OK without syringe check sample flow path for obstruction • If Error still occurs check: - Optical sensor - Stepper motor - Belt tension
24	The spindle does not rotate. No pulses created by the rotation sensor	See Error 23

7.1.3 NEEDLE UNIT		
ERROR:	***CAUSE:***	***ACTION:***
30	The sample needle arm did not reach or leave the home position. (vertical) The status from the needle arm "home sensor" does not change after a vertical arm movement	• Move the needle arm down in the service mode. • If there is no movement at all check: - Stepper motor - Belt - Pulleys • If the needle arm moves down For ± 2cm check: - Optical sensor
31	The sample needle arm is in an invalid horizontal position while moving down. During the down movement from the needle arm the needle holder is set into an incorrect position	• Only activated by an improper use of the system Press STOP twice to deactivate the Error.
32	The sample needle arm did not reach its destination within a certain time	Check: - Belt tension Loosen pulleys Position and home sensor of horizontal needle movement.
34	Sample needle arm not in vertical home while moving horizontally. The status of the vertical home sensor is not the same as the software expects	Check, in the service mode, the status of the vertical home sensor 1 if light-beam interrupted 0 if light-beam not interrupted
39	Vial sensor sticks. The software tells the needle arm to move down while the status of the vial sensor is 1	Check the vial sensor in the service mode 1 if light-beam interrupted 0 if light-beam not interrupted Check if the vial stripper can move up and down without any obstructions
40	The sample needle spindle does not rotate correctly. The software tells the sample needle to move up or down but there are no pulses generated by the sensor	Check the sample needle mechanism for any obstructions. For example: Sample needle broken Belt broken Sensor defect Transport block sticks on shaft (clean shafts) Motor brushes worn-out Flex PCB broken or interrupted
41	The sample needle did not reach or leave home position. The software tells the sample needle to move up or down and the status of the sample needle home sensor does not change	Check the sample needle home sensor in the service mode
42	The sample needle is not at home position. A horizontal or vertical movement from the needle holder is requested and the output from the sample needle home position sensor is 0.	Check if the sample needle is completely up if yes check the sample needle home sensor in the service mode



7.1.4 PLATE

ERROR:	*CAUSE:*	*ACTION:*
58	Not enough plates in right lift to execute	Check if the number of plates in right lift is corresponding to the programmed numbers.
59	Missing plate	Check if plate is placed in the tray holder, or check the vial sensor in the service mode.

7.1.5 VIALS

ERROR:	*CAUSE:*	*ACTION:*
60	Missing vial. Only available when Skip Missing Vial is set to NO in the System Settings or during the execution of the Mix of a sample on 48-vial plate	Check if plate is placed in the tray holder, or check the vial sensor in the service mode.
62	Missing transport vial	Check if the programmed transport vials are placed.
64	Missing vial for reagent A	Check if vial for reagent A is placed.
65	Missing vial for reagent B	Check if vial for reagent B is placed.
66	Missing vial for reagent C	Check if vial for reagent C is placed.
67	Missing vial for reagent D	Check if vial for reagent D is placed.
68	Missing destination vial	Check if programmed range of destination vials are placed.
69	Not enough transport liquid available due to missing transport vials	Check if programmed range of transport vials are placed, or if programmed range contains the necessary volume.

7.1.6 ELECTRONICS

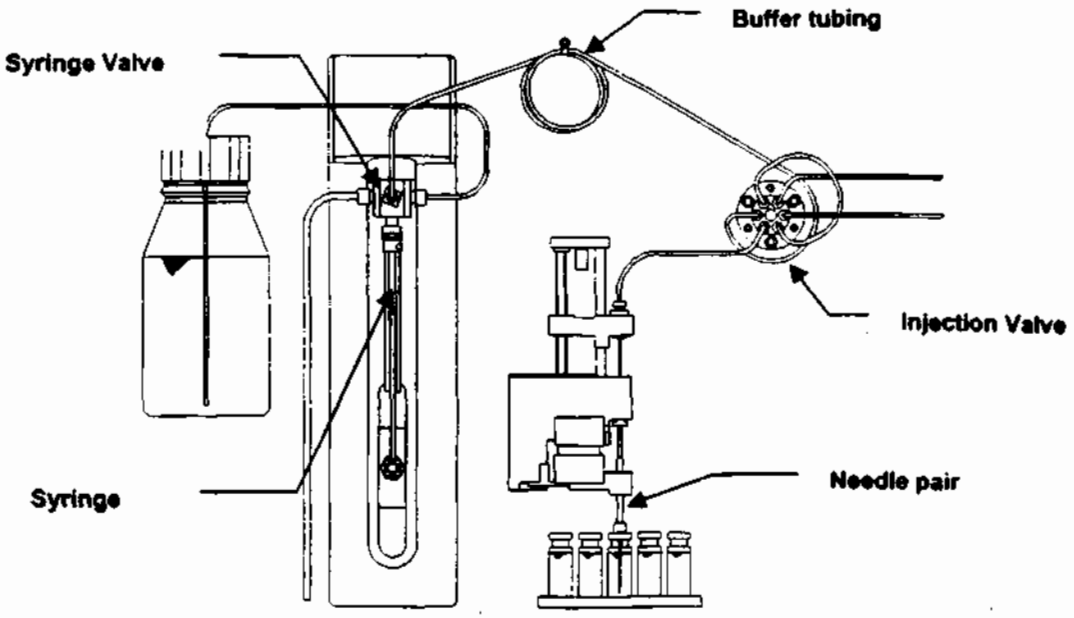
ERROR:	*CAUSE:*	*ACTION:*
71	Flex PCB of the sample needle is not connected.	Check for a proper installed flex PCB on the needle board. Check in service mode for status.
72	Invalid configuration of the Endurance. If a PCB required to operate the unit is missing	Check for loosen PCB's
73	Current limit of the external I/O exceeded If the current for the external 24 V exceeds 500 mA	Disconnect remote connectors.
75	Error occurred during initialization, the ENDURANCE can not start	An essential part is not properly working and the ENDURANCE can not execute the programmed method Turn mains power off, power up the unit again and check for other error codes for more details.

7.1.7 FEEDER		
ERROR:	***CAUSE:***	***ACTION:***
80	Illegal feeder grab rotation	
81	Feeder home timeout	
82	Feeder grab not home	
83	Grab clamp error	Clamp did not switch in time
85	Wrong tray configuration to execute mix	Check system settings 10 ml vials #1-4

7.1.8 FEEDER & TRAY		
ERROR:	***CAUSE:***	***ACTION:***
90	Tray home timeout	Check tray movement for mechanical obstruction Check for proper installed tray Check if the gearwheel is slipping on motor axle Check for damaged gear rack on the tray Check spring force of the gear wheel. Check home sensor in service mode. Check sensor vane of the tray
91	Tray not home during run	See error code 90
92	No tray plate found	Check if the tray holder is placed Check optical tray home sensor in service mode
93	Tray movement blocked error	See error code 90
94	Wrong grabber arm position	
95	Left lift not empty before run	Check if any well plates are placed in left lift Check optical well plate sensor
96	Grabber position horizontal/ vertical not reached in time.	Check for any mechanical obstruction Check alignments as described in chapter 5

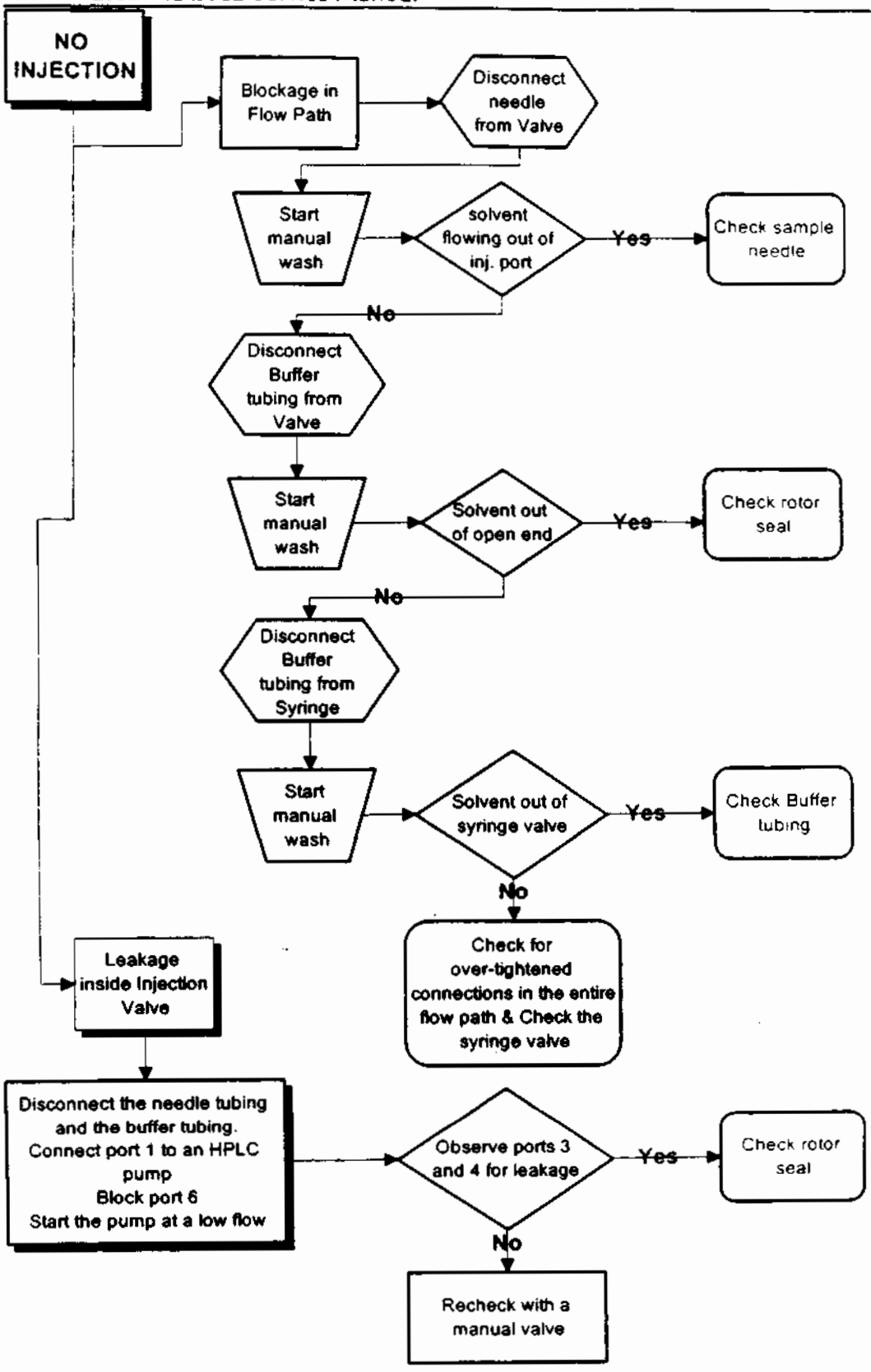
7.2 ANALYTICAL

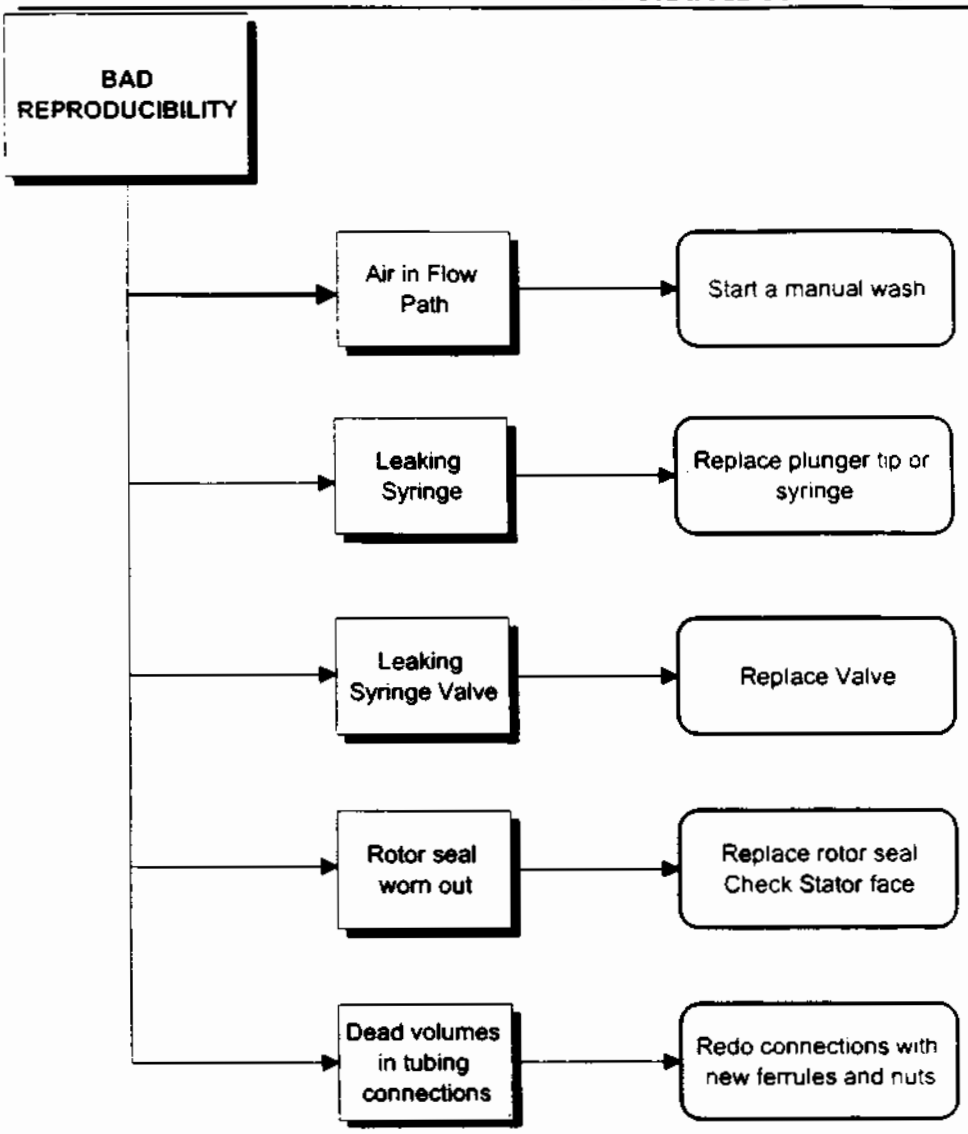
In cases of analytical problems, the best thing to start with is to determine, if the cause for the problem is in the Autosampler, or in the rest of the system.
In order to do this, replace the Autosampler by a manual injection valve and perform some manual full loop injections.
If the results are fine the fault has to be found in the Autosampler, if not the HPLC system should be checked.



NOTE:
In the diagrams on the next pages it is assumed that the unit is working without Errors.

Please keep in mind that analytical problems also might be caused by external influences, like temperature and or light sensitive samples. For this reason it is important to be sure the application was running without problems before and nothing has been changed.


NO INJECTION
Blockage in Flow Path
Disconnect needle from Valve
Start manual wash
solvent flowing out of inj. port
Yes
Check sample needle
No
Disconnect Buffer tubing from Valve
Start manual wash
Solvent out of open end
Yes
Check rotor seal
No
Disconnect Buffer tubing from Syringe
Start manual wash
Solvent out of syringe valve
Yes
Check Buffer tubing
No
Check for over-tightened connections in the entire flow path & Check the syringe valve
Leakage inside Injection Valve
Disconnect the needle tubing and the buffer tubing.
Connect port 1 to an HPLC pump
Block port 6
Start the pump at a low flow
Observe ports 3 and 4 for leakage
Yes
Check rotor seal
No
Recheck with a manual valve


BAD REPRODUCIBILITY
Air in Flow Path
Start a manual wash
Leaking Syringe
Replace plunger tip or syringe
Leaking Syringe Valve
Replace Valve
Rotor seal worn out
Replace rotor seal Check Stator face
Dead volumes in tubing connections
Redo connections with new ferrules and nuts



8 NEEDLE VOLUMES

The ENDURANCE can be equipped with several types of needles, all the needles are only available as an assembly (supplied with tubing, nuts and ferrules)

All the needles are also supplied with an air nut.
The air nut should be replaced when changing the sample needle from a different version, in order to take care for the same overhead vial pressure.

All types of needles are using the same air/pre-puncturing needle

PART NUMBER	DESCRIPTION
0900.718	Air/pre-puncturing needle incl. seal
0900.303	Standard stainless steel sample needle, supplied with TEFZEL tubing
0900.304	Serum stainless steel sample needle, supplied with TEFZEL tubing
0900.311	Peek sample needle
0900.318	Silc/steel sample needle
0900.319	Silc/steel serum sample needle
0900.325	Fused silica sample needle
0900.321	Stainless steel sample needle extra long version, supplied with TEFZEL tubing
0900.322	Serum stainless steel needle extra long version, supplied with TEFZEL tubing
0900.323	Peek sample needle extra long version
0900.326	Fused silica needle extra long version

Needles volumes:

Stainless Steel Needles				Tubing			Total
Part number	O.D. (mm)	I.D.(mm)	Length (mm)	O.D.(mm)	I.D.(mm)	Length (mm)	Volume
0900.303	0,64	0,25	135	1,6	0,25	140	15 µl
0900.304	0,7	0,4	135	1,6	0,5	140	45 µl
0900.321	0,64	0,25	135	1,6	0,25	420	30 µl
0900.322	0,7	0,4	135	1,6	0,5	420	100 µl

The silc/steel needles has the same volumes as the stainless steel versions

Peek Needles				
Part number	O.D.(mm)	I.D.(mm)	Length (mm)	Volume
0900.311	0,65	0,25	300	15 µl
0900.323	0,65	0,25	610	30 µl

Fused Silica Needles				
Part number	O.D.(mm)	I.D.(mm)	Length (mm)	Volume
0900.325	0,375	0,15	300	5,3 µl
0900.326	0,375	0,15	585	10,3 µl



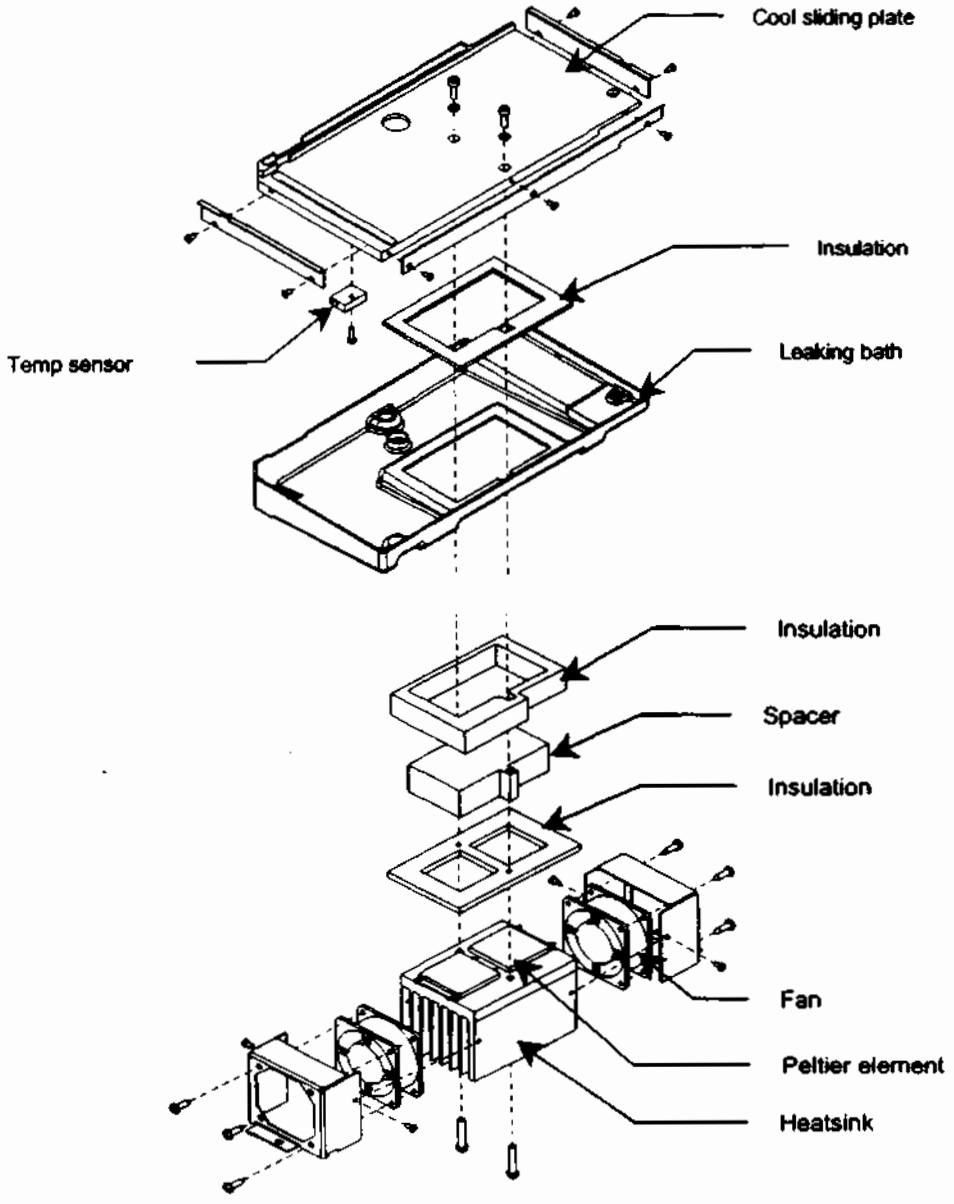
NOTE:

When the injection valve is mounted on the right side, e.g. using the ENDURANCE in combination with the Mistral, the sample needle should be an extra long version.

9 COOLING OPTION

The Endurance can optional be equipped with a Peltier cooling.
The cooling option is located below the tray holder sliding plate.
Two fan's are removing the heated air from the heatsink, which is mounted directly below the peltier elements.

An additional fan is located on the rear-side, to cool the heatsink of the CPU board.
The temperature sensor is located at the bottom of the tray holder sliding plate



In case of a defective peltier element it is strongly recommended to replace the peltier elements including the heatsink, spacer and insulation as a complete replacement sub assembly.
This replacement sub assembly comes including the necessary connector to the Cooling PCB.
See also drawing no. 71.0920.840 in this service manual for partnumbers and details.



10 LIST OF ACCESSORIES

Part Number	Description
SP920.000	**Endurance Autosampler**
SP920.001	**Endurance Cool**
SP920.002	**Endurance Bio**
SP920.003	**Endurance Bio & Cool**
SP920.010	**Endurance ISS**
SP920.011	**Endurance Cool & ISS**
SP920.012	**Endurance Bio & ISS**
SP920.013	**Endurance Bio, Cool & ISS**
SP920.020	**Endurance SSV**
SP920.021	**Endurance SSV & Cool**
SP920.030	**Endurance SSV & ISS**
SP920.031	**Endurance SSV, ISS & Cool**
SP921.000	**Endurance with feeder**
SP921.002	**Endurance feeder Bio**
SP921.010	**Endurance feeder & ISS**
SP921.012	**Endurance feeder Bio & ISS**
SP921.020	**Endurance feeder SSV**
SP921.030	**Endurance with feeder, SSV & ISS**
0920.766	**SparkLink PC control** SparkLink PC control, including CD-ROM, Endurance hardware protection key and PC serial interface cable
0700.150	**SparkLink PC control interface** Interfacing SparkLink PC control to HP Chemstation, hardware protection key and remote input cable. (This option has to ordered in combination with a SparkLink PC control package)
0043.364	Needle wash insert vial
0043.473	Needle body
0900.300	BIO compatible injection valve assembly (with Rheodyne 9740)
0900.301	Injection valve assembly (with Rheodyne 7739)
0900.303	Standard sample needle, incl. tubing, ferrules and nuts
0900.304	Serum sample needle, incl. tubing, ferrules and nuts
0900.311	Peek sample needle, incl. tubing, ferrules and nuts
0900.318	Silc/steel sample needle, incl. tubing, ferrules and nuts
0900.319	Silc/steel serum sample needle, inlc. tubing, ferrules and nuts
0900.321	Sample needle extra long (necessary when inj. valve is mounted on the right side)
0900.322	Serum sample needle extra long (necessary when inj. valve is mounted on the right side)
0900.323	Peek sample needle extra long (necessary when inj. valve is mounted on the right side)
0900.325	Fused silica sample needle
0900.326	Fused silica needle extra long (necessary when inj. valve is mounted on the right side)
0900.710	Buffer tubing 500 µl
0900.711	Buffer tubing 2000 µl
0900.712	Syringe waste tubing
0900.713	Syringe wash tubing
0900.714	Tubing SSV ⇒ syringe valve
0900.715	Buffer 15 ml
0900.718	Air/ pre-puncturing needle
0900.740	Wash solvent vial assembly 250ml
0900.750	Vial 10 ml (pck/125)
0900.751	Cap for 10 ml vials (pck/125)
0900.752	Septa for 10 ml vials (pck/125)

2140.151	Syringe valve
2140.160	Luer lock connector syringe valve
3796.091	Stator for Rheodyne 7739 valve
3796.092	Vespel rotor seal for Rheodyne 7739 valve
3796.093	Tefzel rotor seal for Rheodyne 7739 valve
3796.095	PEEK stator for Rheodyne 9740 valve
3796.096	Ceramic Stator face assy for Rheodyne 9740 valve
3796.097	PEEK rotor seal for Rheodyne 9740 valve
3796.035	Rheodyne stainless steel loop 5 µl
3796.009	Rheodyne stainless steel loop 10 µl
3796.010	Rheodyne stainless steel loop 20 µl
3796.011	Rheodyne stainless steel loop 50 µl
3796.012	Rheodyne stainless steel loop 100 µl
3796.013	Rheodyne stainless steel loop 200 µl
3796.014	Rheodyne stainless steel loop 500 µl
3796.015	Rheodyne stainless steel loop 1000 µl
3796.076	Rheodyne PEEK loop 20 µl
3796.016	Rheodyne PEEK loop 100 µl
0700.008	Rheodyne Rhe-Flex ferrule / pck of 10
0700.009	Rheodyne Rhe-Flex nut / pck of 10
0700.010	Flanged tubing fitting 1/8" / pck of 5
0700.011	Flanged tubing fitting 1/16" / pck of 5
4400.000	Syringe 1000 µl
4400.001	Syringe 10 ml
4400.030	Syringe 100 µl
4400.250	Syringe 250 µl
4400.500	Syringe 500 µl
0700.012	Plunger replacement tips 100 µl (Set of 10)
0900.742	Plunger replacement tips 250 µl (Set of 10)
0700.018	Plunger replacement kit 500 µl (Set of 10)
0700.019	Plunger replacement kit 1000 µl (Set of 10)
4400.600	Plunger replacement tips 10 ml.

11 CALIBRATION AND PERFORMANCE CHECK

To be carried out by personal with good knowledge of HPLC instrumental laboratory practice.

11.1 SETTINGS/ADJUSTMENTS

Check the "System" settings "General" , the default and for this check assumed values are:

- Loop volume: 100 µl
- Needle tube volume: 15 µl
- Syringe volume: 250 µl
- Dispenser speed: Normal
- Sample needle height: 05mm
- Skip missing well: YES
- Air segment: YES
- Head space pressure: NO

Choose for the performance test (par.3) in the "plates"-settings the 48-vial adapter.

Check the optical sensors of the needle unit visually. If they look dirty then clean the optical path (e.g. water or methanol).

Check the sample needle height as follows (Ready mode):

- Set sample needle height at "0" in "System" settings "General", and remove the wellplate
- Run a series or use the service mode to move the needle down.
- Check the position of the needle point, it should be just above the tray bottom.



ATTENTION:

Many safety precautions are in the service mode overruled, so be careful in selecting functions to perform.

- If needle height is correct, set the "software" height back to the old value in "System" settings "General". Preferably not at zero.
- If necessary, adjust the needle depth mechanically just above tray bottom, having the "software" height set at 0 in "System" settings "General".
- Proceed to "Ready mode"
- Move needle-holder assy manually forward.
- Pull the spring-loaded stripper up.
- Check that the sample needle is positioned just inside the air needle (not visible anymore).



ATTENTION:

This last requirement is essential and overrules the preceding adjustments

Check the needle penetration position with the aid of; a: a few empty capped vials in the 48-vial adapter, or b: wellplate with capmat

- Run a series or use the service mode to move the needle into a vial.
- Check the position of the penetration holes of the septa (centre ± 0.5mm).
- If necessary, correct the position checked out on the wash-position, as follows:
  - a. forward/backward; by changing the position of the code-strip on the left side of the needle arm.
  - b. left/right; change the sensor vane on the back side of the tray.

Secure adjustment screws and mark it with red paint.

11.2 FUNCTIONS

Check the dispenser and connected tubing by performing a few Wash routines. Check for leakages of the tube connections, the syringe Luer-lock connection and the syringe plunger.

Perform also a "Syringe end" and "Syringe home" to check the drain connections.
Remove a possible air-bubble above the syringe plunger.

Check the leakage drains of the tray and the injection valve by inserting some water.

If a cool option is present then check the performance by measuring the time required to cool from ambient minus 15°C. Required time is appr. 15 min.
Note: Setpoint is 4°C, so do not perform this check at ambient temperatures below 19°C.

11.3 PERFORMANCE

Carry out a shortened test procedure as described in the chapter 12 of this manual
Reproducibility should be <= 1%
Memory effect should be < 0.2%
If reproducibility and/or memory effect is not correct:

- Check needle and tube connections between needle and injection valve on dead volume or blockage.
- Check injection valve on leakage's (See chapter 4.3).

Repeat if a possible cause has been found and corrected.

12 ANALYTICAL TEST

The Endurance is factory tested for reproducibility, carry-over and mixing according to the following test procedure.

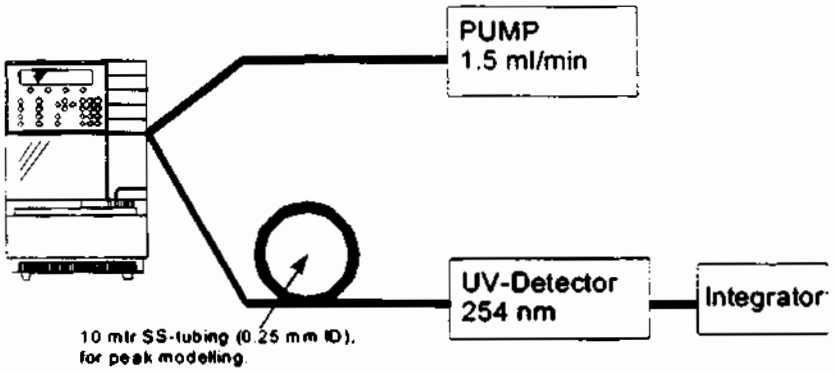
12.1 ANALYTICAL PERFORMANCE TEST

12.1.1 ANALYTICAL SYSTEM

The Endurance is tested in an analytical system under the following conditions:

Pump	flow:	1.5 mL/min
	eluent:	distilled water
Detector	wavelength:	254 nm
Sample:		Uracil in distilled water (50 ppm)

The following configuration was used:



12.1.2 RELATIVE STANDARD DEVIATION (RSD%)

The following formulas are required for calculating the RSD:

$$\overline{Peak\ area} = \frac{\sum Peak\ area}{n}$$

$$\sigma_{n-1} = \sqrt{\frac{\sum \left(Peak\ area - \overline{Peak\ area}\right)^2}{n-1}}$$

$$RSD\% = \frac{\sigma_{n-1}}{Peak\ area} \times 100\%$$

12.1.3 REPRODUCIBILITY TEST

The default system settings were used, except for the following:

<GENERAL> Air segment: NO

<PLATES> Location first transport vial: 1

Location last transport vial: 1

A deepwell plate is filled with sample on positions A1 - A6.

The transport solvent vial is filled with eluent.

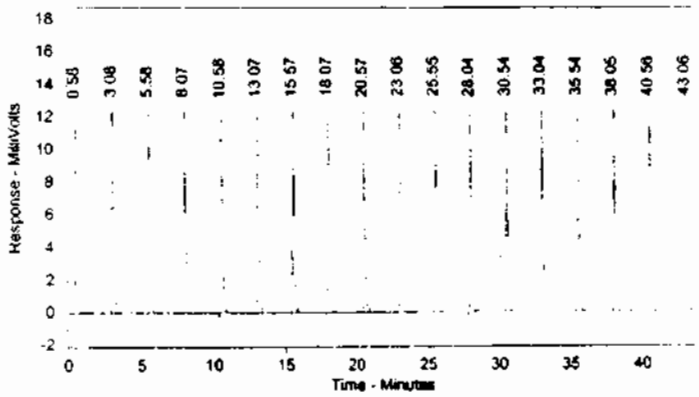
The wash solvent bottle is filled with 80% H_2O / 20% Iso-propanol.

Injection method		**Wash method**		**Series**	
Number	1	Number	1	Number	1
Type	µl pick-up	Wash between injections		First well	A 01
Analysis time	1:00 min	Wash volume	300 µL	Last well	A 06
Injections/well	3			Injection method	1
Injection volume 1	5 µL			Wash method	1
Injection volume 2	5 µL				
Injection volume 3	5 µL				

Example chromatogram of the reproducibility test:

ANALYTICAL IDENTIFICATION SHEET AUTOSAMPLERS
ACCORDING TO 0051.651

Date: 22/06/1999 10:45.18
Raw file: C:\PROGRA~1\CPSPIRIT\Test2 0161.RAW
Method: C:\Program Files\CPSpirit\std.met
Serial number: 92090082
Tested on system: Chrom 2



Peak #	Rel. Time	Peak Area	Peak Height
1	0.58	111071.1	12320.7
2	3.08	111477.3	12391.2
3	5.58	111387.0	12388.3
4	8.07	111475.8	12408.9
5	10.58	111357.6	12319.8
6	13.07	111592.7	12373.1
7	15.57	111499.2	12402.4
8	18.07	111518.3	12416.0
9	20.57	111539.2	12367.8
10	23.06	111313.4	12413.1
11	25.55	111271.1	12397.3
12	28.04	111450.0	12358.7
13	30.54	111545.1	12381.0
14	33.04	111557.8	12440.7
15	35.54	111540.9	12399.3
16	38.05	111322.6	12363.9
17	40.56	111468.4	12387.7
18	43.06	111637.7	12409.1

RSD (Area) % 0.1238727

12.1.4 CARRY-OVER TEST

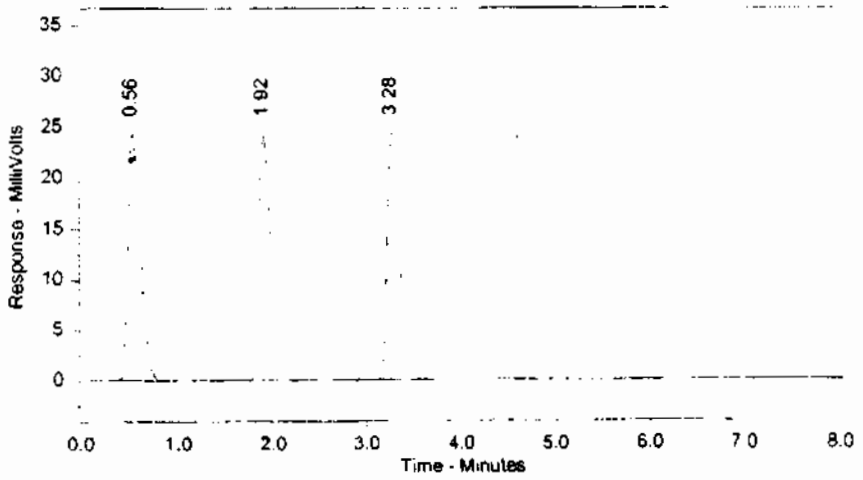
The default system settings were used, except for the following:
A plate with one sample well filled with sample 50 ppm Uracil, (A01), one sample well filled with eluent (A02) is placed in the Endurance.
10 µL will be injected.
The wash solvent bottle is filled with 80% H_2O / 20% Iso-propanol.

Injection method		**Series 1**	
Number	1	Number	1
Type	partial loopfill	Injection method	1
Analysis time	1:00 min	Wash method	None
Flush volume	35 µL	Mix method	None
Injections/well	3	First well	A 01
Injection volume 1	10 µL	Last well	A 02
Injection volume 2	10 µL		
Injection volume 3	10 µL		2

Example chromatogram of the carry-over test:

ANALYTICAL IDENTIFICATION SHEET AUTOSAMPLERS
ACCORDING TO 0051 651

Date: 22/06/1999 11:20:30
Raw file: C:\PROGRA~1\CPSPIRIT\Test2.0164.RAW
Method: C:\Program Files\CPSpirit\std.met
Serial number: 92090082
Tested on system: Chrom 2



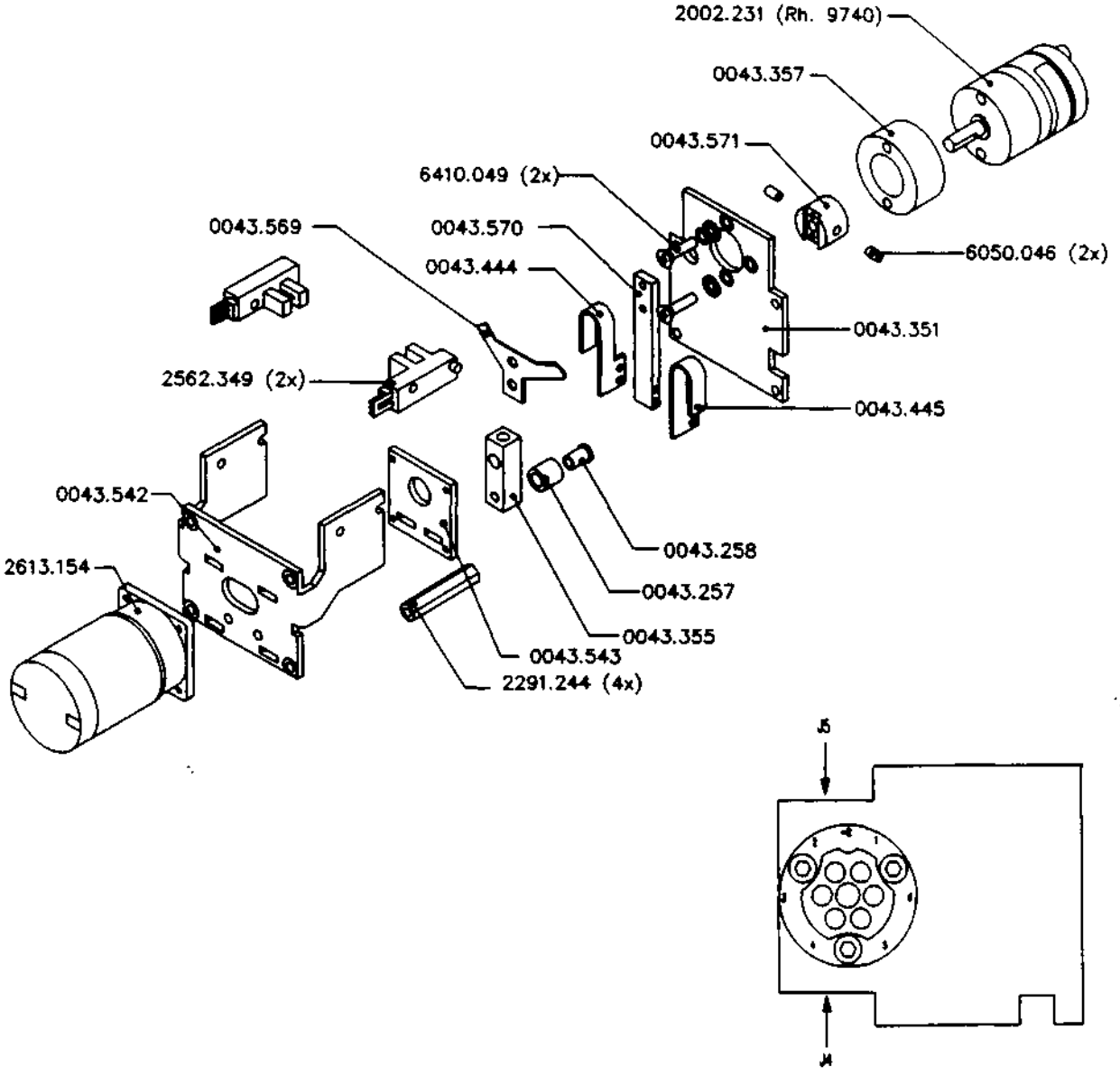
Peak #	Ret. Time	Peak Area	Peak Height
1	0.56	213903.6	24429.7
2	1.92	213661.2	24399.0
3	3.28	213993.5	24452.2

RSD (Area) % 8.036543E-02

PARTS LIST 0900.300

P/N: 0900.300 Bio Compatible Injection Valve assy

Component	Description	Quantity
0043.257	Bearing	1
0043.258	Bearing shaft	1
0043.351	Valve mounting plate	1
0043.355	Motor lever	1
0043.357	Valve spacer	1
0043.444	Valve spring left	1
0043.445	Valve spring right	1
0043.542	Sensor/motorplate	1
0043.543	Motorplate	1
0043.569	Sensor bracket	1
0043.570	Valve lever	1
0043.571	Extension shaft	1
0900.805	Valve unit cable set	1
2002.231	Rheodyne injection valve (PEEK) 9740	1
2291.244	Spacer M4 x 7 35	4
2537.222	Capacitor 2,2uF-100Vdc	1
2562.349	Opto interruptor	2
2613.154	Maxon DC motor 12V gear 18:1	1
6050.046	Adj. Screw hex M4x6	2
6084.204	Spring washer M4	2
6215.907	Screw EVRZ CK-ZS M2,5x10	4
6405.051	Bolt M5x10 SS	1
6410.049	Screw VK UNCX 1,25"-4,8	2



Revision:	GSC 03-06-96	Appr'd:	GSC 19-06-96	Appr'd:	GSC 29-10-97	Appr'd:	Appr'd:

INCLUDE INSPECTION REPORT | ○ All measures | ○ Measures marked & | ○ None

Mat.: | Toler.:

Finish.: | Ra.:

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Title: VALVE SUB ASSY BIO

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INSTRUMENTS FOR HPLC

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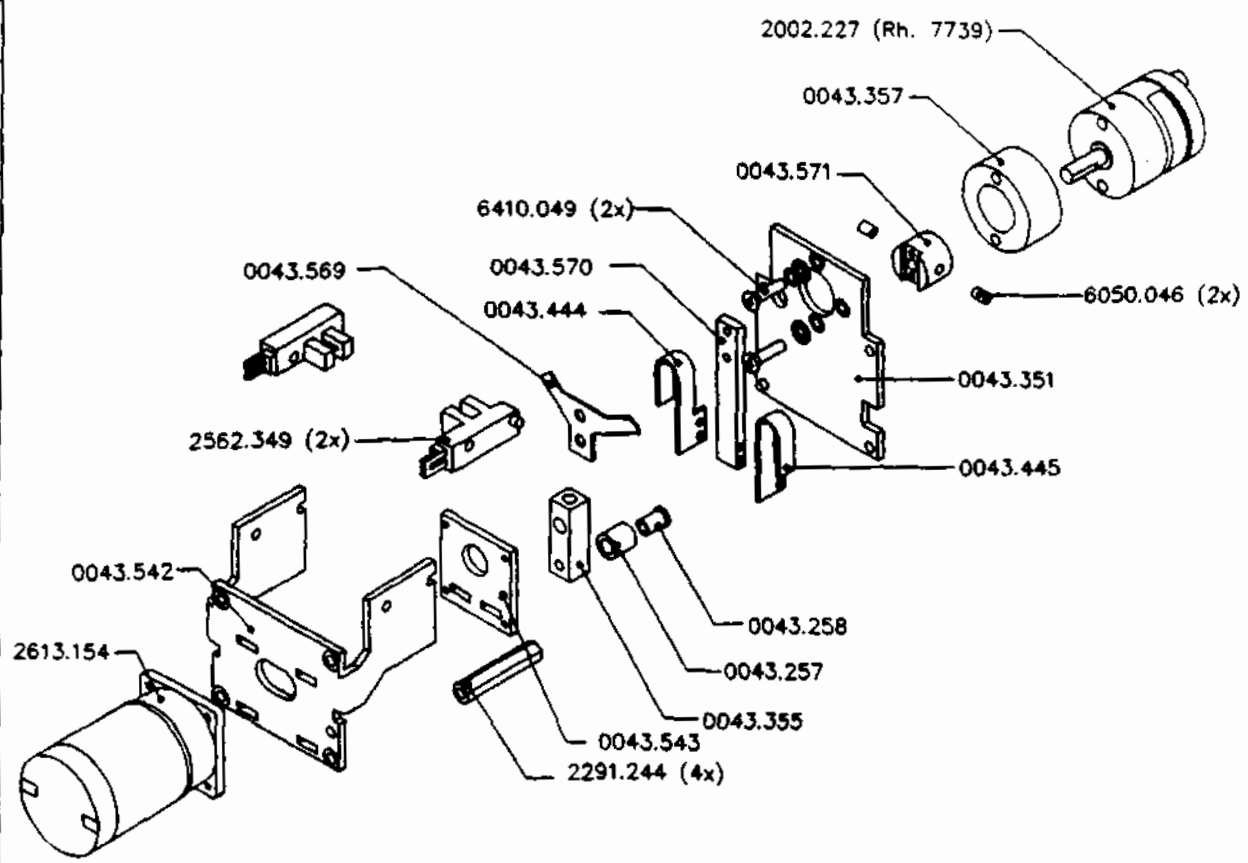
Appr'd: | 1st Rev.: 22-03-94

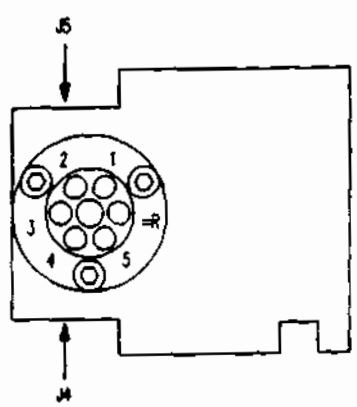
Proj.method: | Scale: | 1/1 | 71.0900.300.4.4

PARTS LIST 0900.301

P/N: 0900.301 Injection Valve sub assy

Component	Description	Quantity
0043.257	Bearing	1
0043.258	Bearing shaft	1
0043.351	Valve mounting plate	1
0043.355	Motor lever	1
0043.357	Valve spacer	1
0043.444	Valve spring left	1
0043.445	Valve spring right	1
0043.542	Sensor/motorplate	1
0043.543	Motorplate	1
0043.569	Sensor bracket	1
0043.570	Valve lever	1
0043.571	Extension shaft	1
0900.805	Valve unit cable set	1
2002.227	Rheodyne injection valve (SS) 7739	1
2291.244	Spacer M4x7x35	4
2537.222	Capacitor 2,2uF-100Vdc	1
2562.349	Opto interruptor	2
2613.154	Maxon DC motor 12V gear 18:1	1
6050.046	Adj. Screw hex M4x6	2
6084.204	Spring washer M4	2
6215.907	Screw EVRZ CK-ZS M2,5x10	4
6405.051	SS Bolt M5x10	1
6410.049	Screw VK UNCX 1,25°-4,8	2





INCLUDE INSPECTION REPORT | ○ All measures | ○ Measures marked & | ○ None

Revision: | GSC 03-06-96 | Appr'd: | GSC 29-10-97 | Appr'd: | Appr'd: | Appr'd: | Appr'd:

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Finish.: | Ra.:

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Title: INJECTION VALVE SUB ASSY

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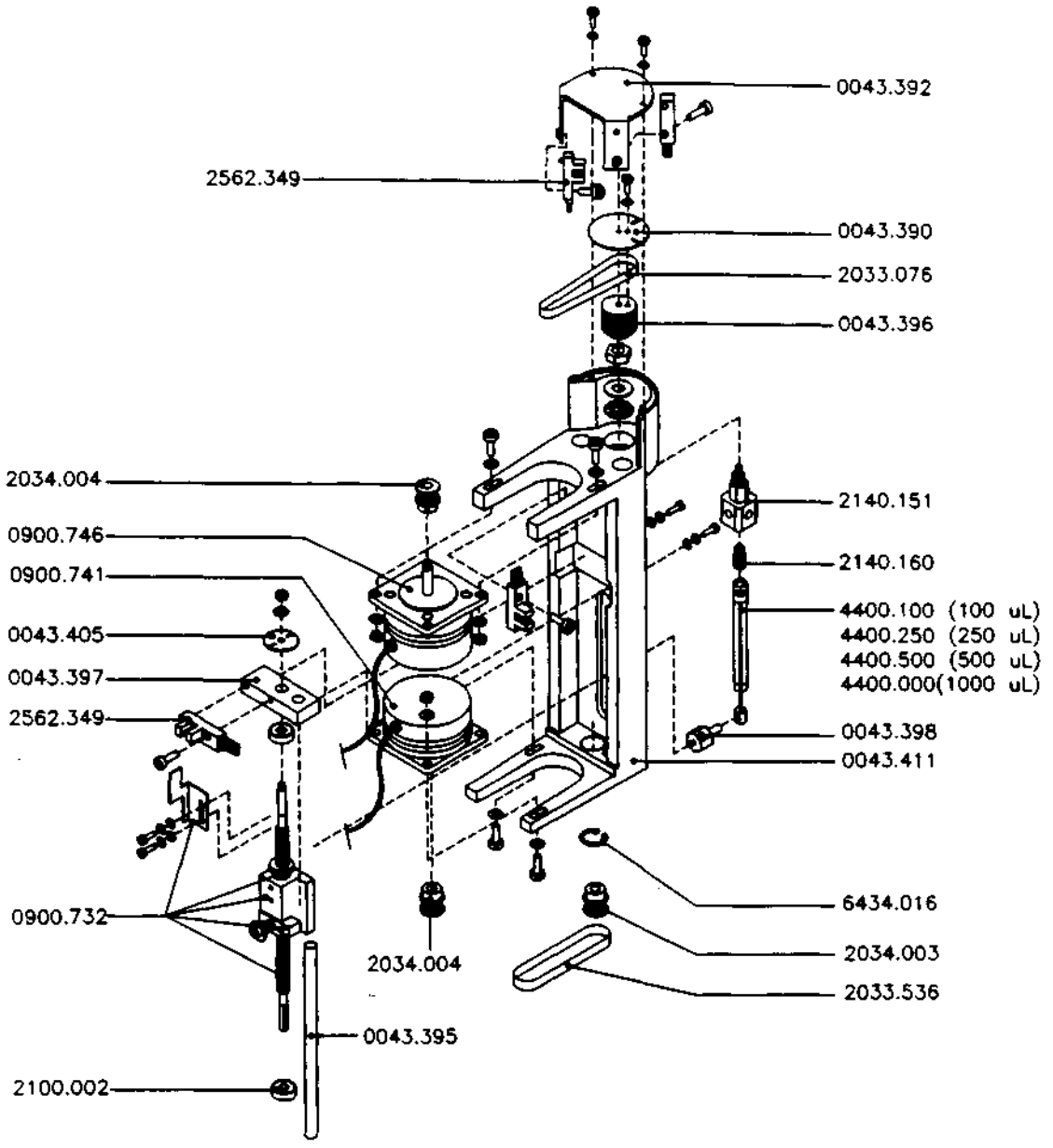
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Proj.method: | Scale:

PARTS LIST 0900.302

P/N: 0900.302 Syringe Dispenser

Component	Description	Quantity
0043.390	Valve sensor disc	1
0043.392	Top cover syringe	1
0043.395	Guiding shaft	1
0043.396	Pulley	1
0043.397	Guiding block top	1
0043.398	Piston holder	1
0043.405	Rotation sensor disc	1
0043.411	Dispenser Frame	1
0900.732	Transport block spindle assy	1
0900.741	Replacement steppermotor assy 2.2 A	1
0900.746	Replacement steppermotor assy 1.05 A	1
0900.807	Dispenser cable set	1
2033.076	Geared belt 760 MXL 025	1
2033.536	Geared belt 520 MXL 025	1
2034.003	Pulley 18 MXL 025	1
2034.004	Pulley PLA 18	2
2100.002	Ball bearing 625-2RS1/625-ZZ	2
2140.151	Modified 7021 KVPD syringe valve	1
2140.160	Luerlock 1/4" fem 0,6 bore	1
2562.349	Optical interruptor	4
4400.250	Syringe 250uL Luerlock	1
6050.030	Setscrew BZK M3x4	1
6062.104	Nut M4	2
6406.014	Screw SS VK-KK 3x6	2
6434.016	Circlip	1



Rev.: | Appr'd: 15-01-96 GSC | Appr'd: 14-10-96 GSC | Appr'd: | Appr'd: | Appr - | Aj.

Mat.: | Toler.:

Finish.: | Ra.:

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Title: SYRINGE DISPENSER

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INSTRUMENTS FOR HELP

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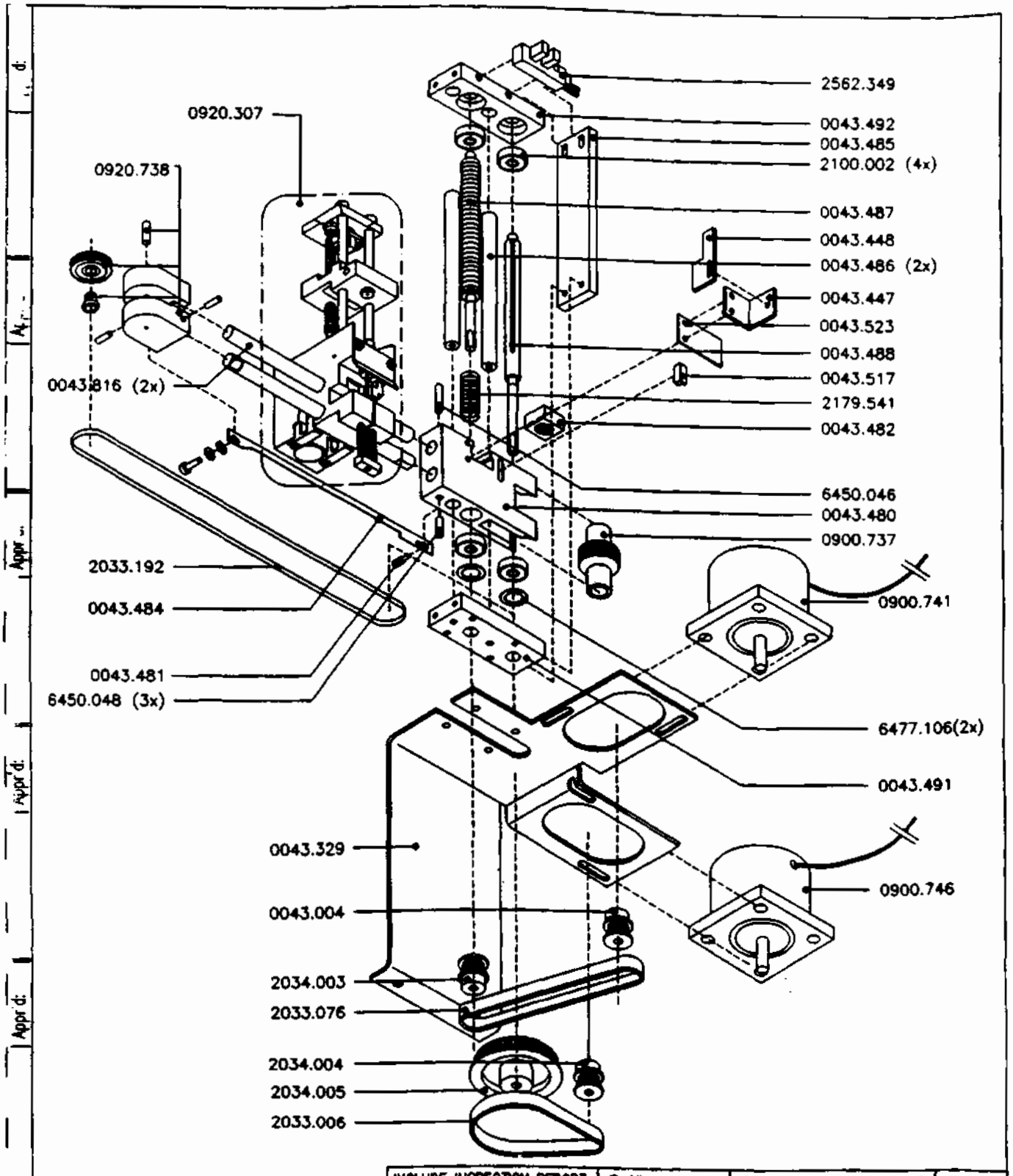
Appr'd: | 1st Rev.: 15-03-95

Proj.method: | Scale: 1:1

PARTS LIST 0920.305

P/N: 0920.305 Needle unit assy 0920

Component	Description	Quantity
0043.329	Motorframe	1
0043.447	Sensor brace	1
0043.448	Sensor adjustment bracket	1
0043.479	Pulley 30mxls	1
0043.480	Transport block	1
0043.481	Mounting pen	1
0043.482	Union nut M10	1
0043.485	Base plate	1
0043.486	Spacer shaft	2
0043.487	Spindle M10	1
0043.488	Spline shaft	1
0043.491	Mounting block bottom	1
0043.492	Mounting block top	1
0043.517	Springblock	1
0043.523	Leaf spring	1
0043.816	Guiding shaft horizontal	2
0043.817	Sensor code strip 0920	1
0900.737	Pulley assy	1
0900.741	Steppermotor assy 2.2A	1
0900.746	Steppermotor assy 1.05A	1
0900.808	Cable set needle unit	1
0920.307	Needle holder endurance	1
0920.738	Stretching block assy	1
2033.006	Geared belt 912 MXL 025	1
2033.076	Geared belt 760 MXL 025	1
2034.003	Pulley 18 MXL 025	1
2034.004	Pulley PLA 18	2
2034.005	Pulley PLB 72	1
2100.002	Ball bearing 625-2RS1/	4
2179.541	Spring D 12060	1
2562.349	Opto interruptor	1
6416.014	Screw SS CK-KK M3x6	1
6450.048	Setscrew SS M4x10	3
6450.050	Setscrew SS M4x16	1
6477.106	Cupped spring washer SS	2
9009.603	Washer SS M3	1
9009.703	Spring washer SS M3	1



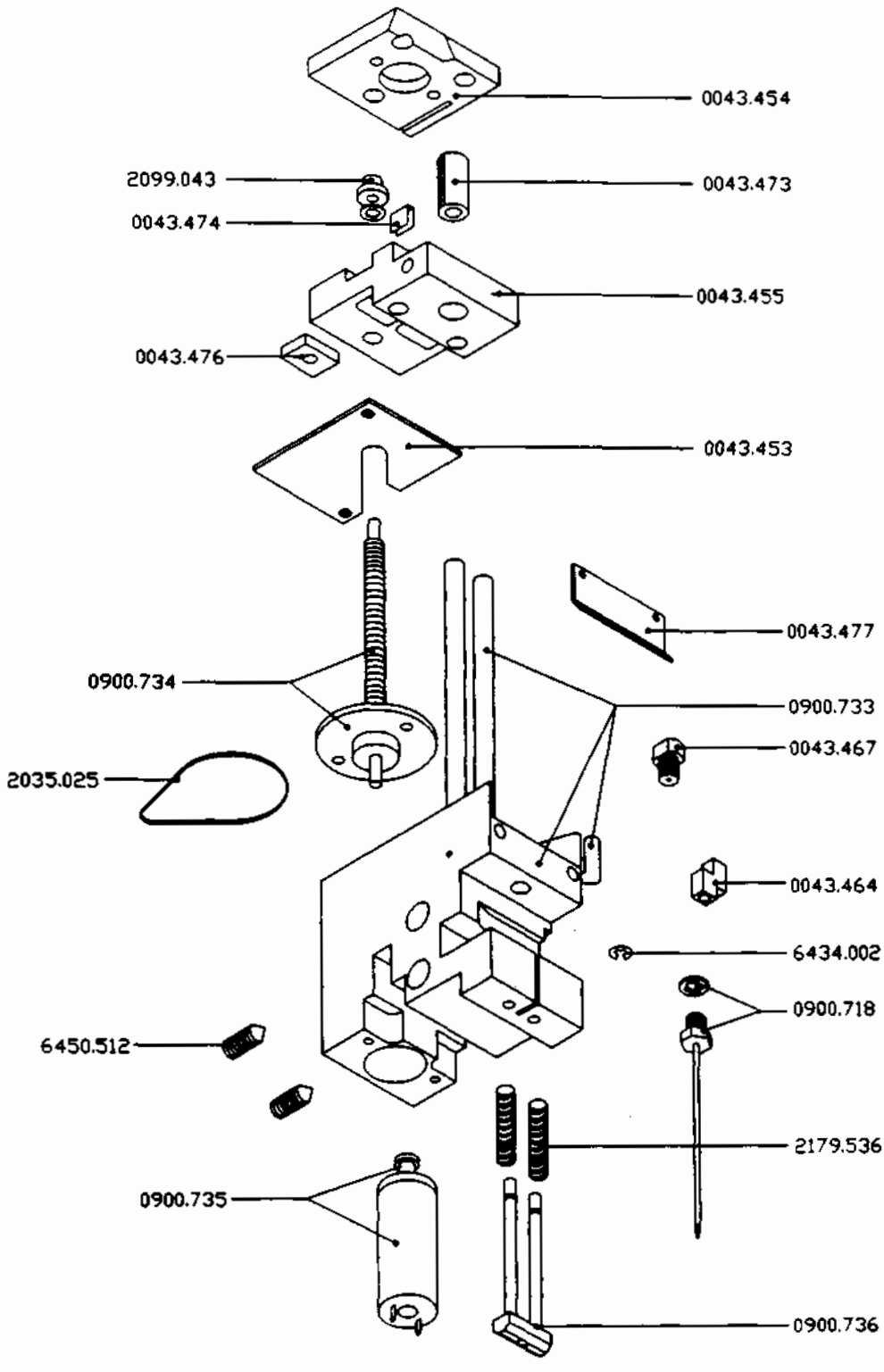
INCLUDE INSPECTION REPORT	○ All measures	○ Measures marked with &	○ None

Revision:	Mat.:			Toler.:	
	Finish.:			Ra.:	
Copyright reserved Spark Holland b.v. Emmen The Netherlands	Title: Needle Unit Assy 920				
Spark	Drawn: GSC		Sheet:	Drawing nr.:	A Rev.:
	Appr'd:	1st Rev.: 09-07-99	1/1	71.0920.305.4.1	
	Proj.method:	Scale:			

PARTS LIST 0920.307

P/N: 0920.307 Needle Holder assy 0920

Component	Description	Quantity
0043.453	Cover plate	1
0043.454	Positioning block	1
0043.455	Transport block	1
0043.464	Detection vane	1
0043.467	Air nut	1
0043.473	Needle body	1
0043.474	Sensor-spring	1
0043.476	Transport Nut M5	1
0043.477	Leakage plate	1
0900.625	Flex PCB assy	1
0900.718	Air-prepuncturing needle (incl. seal)	1
0900.733	Train assy	1
0900.734	Spindle assy	1
0900.735	Sample needle motor assy	1
2033.192	Geared belt 1920 mxl 012	1
2035.025	Belt 25,0x1,2	1
2099.043	Nylon bearing 3mm	1
2179.536	Spring SS CS 124	2
2998.205	Cap	1
6215.901	Screw CKZS M1,6x4	2
6412.042	Screw SS LBK-BZK M3x6	2
6416.014	Screw SS CK-KK M3x6	8
6434.002	Circlip SS 2,3mm	1
6450.032	Setscrew SS 3x6	1
6450.512	Setscrew SS BZk 5x12	2
6624.015	Nylon screw CK-ZS 3x6	2
0900.748	Flex PCB incl. sample needle motor assy	1



INCLUDE INSPECTION REPORT ○ All measures ○ Measures marked with ○ None

Revision

Mat.: Toler.:

Finish: Ra.:

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Title: Needle Holder Assy 0920

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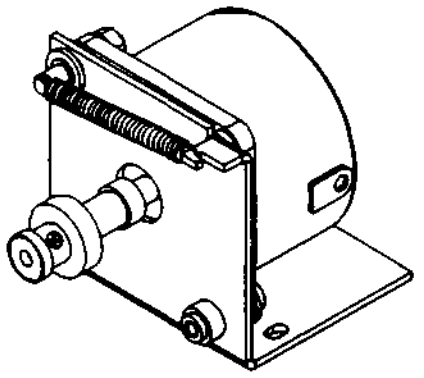
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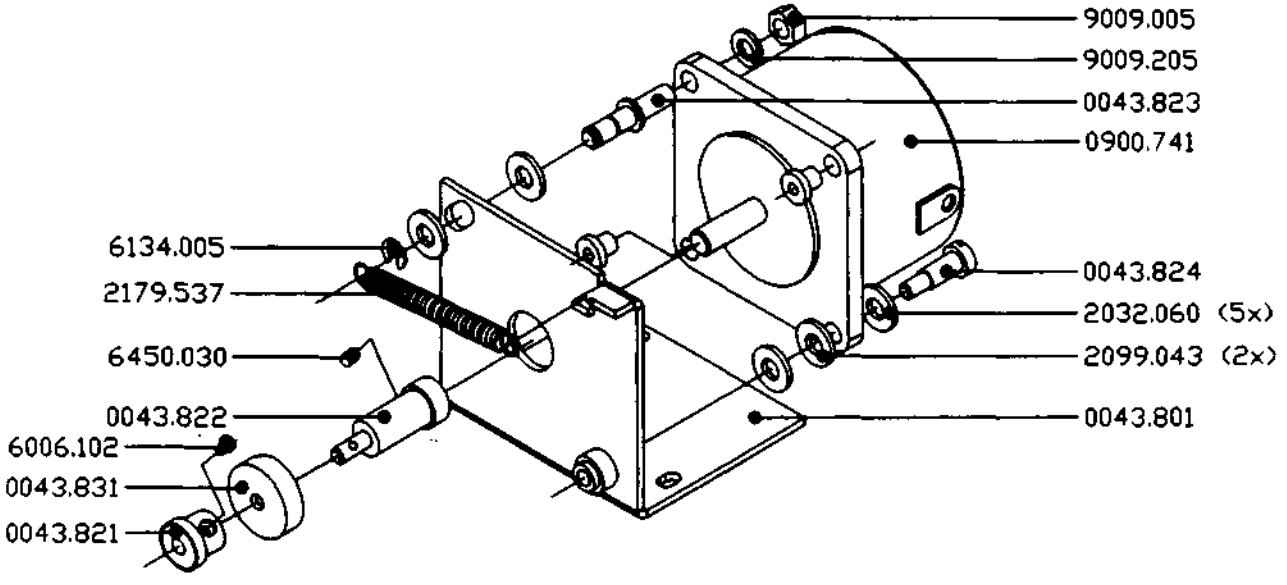
Projmethod: Scale: 1

PARTS LIST 0920.310

P/N: 0920.310 Tray drive motor assy

Component	Description	Quantity
0043.801	Motor bracket	1
0043.821	Tray gear wheel	1
0043.822	Gear wheel axle	1
0043.823	Spring pin	1
0043.824	Pin joint	1
0043.831	Leakage protection ring	1
0900.741	Steppermotor Assy 2.2A	1
2032.060	Skiffy ring M5	5
2099.043	Nylon bearing 3mm	2
2179.537	Spring	1
6006.102	Screw ELVZ VK KK M2x4	1
6134.005	Axle retainer washer 4-5mm	1
6450.030	Setscrew SS M3x4	1





INCLUDE INSPECTION REPORT | ○ All measures | ○ Measures marked with & ○ None

Revisions | Appr'd | Appr'd | Appr'd

Mat.:
Finish:
Toler.:
Ra.:

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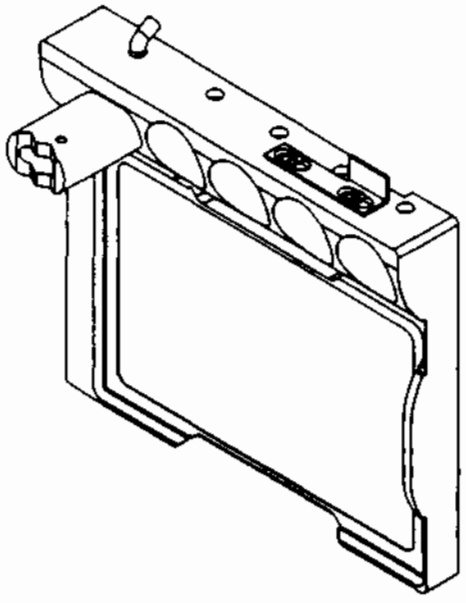
Title: Tray Drive Motor Assy 0920

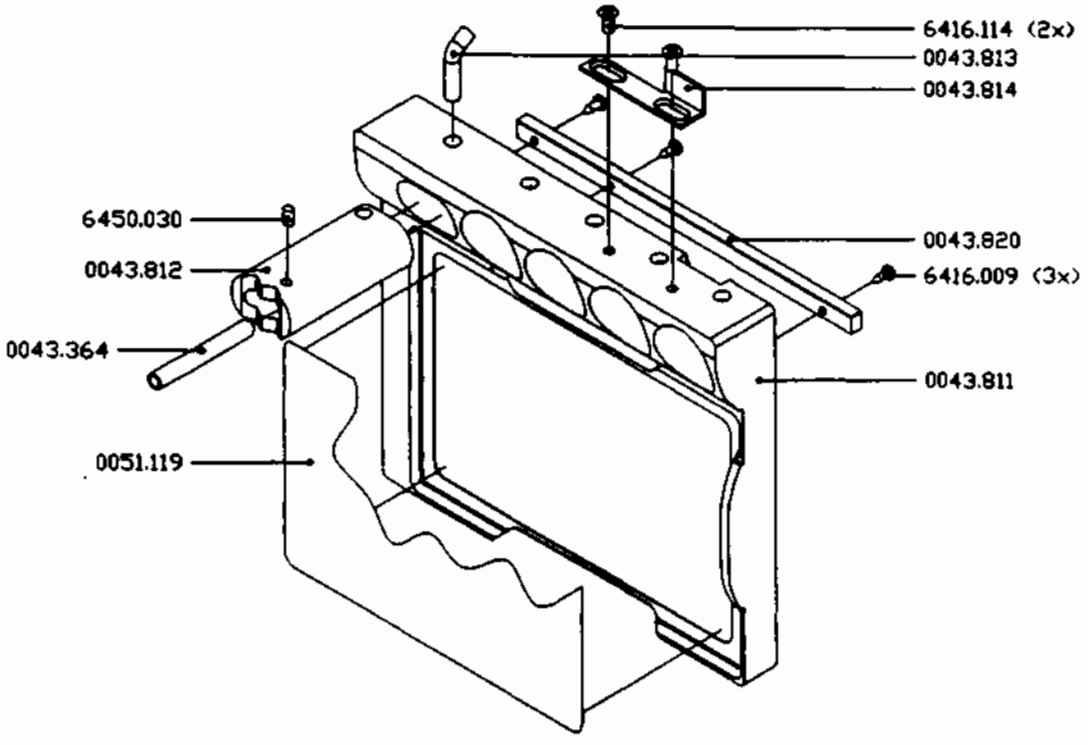
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Appr'd	1st Rev.09-07-99	1/1	71 .0920. 310 .4.1		
Proj.method	Scale:				

PARTS LIST 0920.315

P/N: 0920.315 Plate Holder Assy

Component	Description	Quantity
0043.364	Wash vial	1
0043.811	Tray Holder	1
0043.812	Wash position tray	1
0043.813	Drain pipe tray	1
0043.814	Sensor fane tray	1
0043.820	Gear rack	1
0051.119	Tray label	1
6406.014	Screw SS VK-KK M3x6	2
6416.004	Screw SS CK-KK M2x6	3
6450.030	Setscrew SS M3x4	1





INCLUDE INSPECTION REPORT | ○ All measures | ○ Measures marked with ▲ | ○ None

Revisions | Appr'd | Appr'd | Appr'd | Appr'd

Mat.:

Finish.:

Toler.:

Ra.:

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Title:

Plate Holder Assy 0920

Drawn: GSC

Appr'd:

Proj.method:

1st Rev.:28-10-97

Scale:

Sheet: 1/1

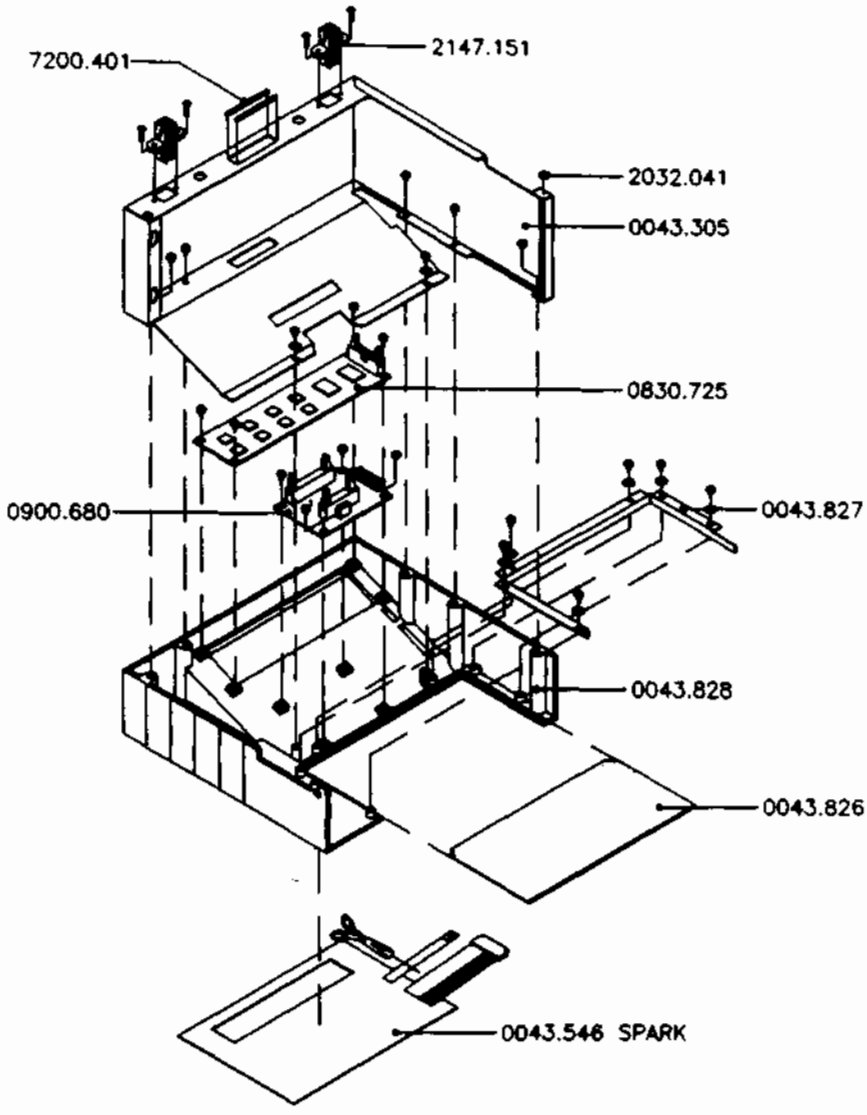
Drawing nr.: 71.0920.315.4.1

A Rev.:

PARTS LIST 0920.320

P/N: 0920.320 Keyboard Assy

Component	Description	Quantity
0043.305	Keyboard cover	1
0043.546	Flatpanel "Spark design"	1
0043.826	Frontglass Endurance	1
0043.827	bracket frontglass	1
0043.828	Keyboardcover frontpart	1
0830.725	Display assy with backlight	1
0900.680	Keyboard/display interf. PCB	1
0900.802	Flatcable display assy	1
2032.041	Selfadh. Protection cap	1
2147.151	Hinge	2
6055.304	Plate screw CK-KK 2,9x6,5	8
6055.305	Plate screw CK-KK 2,9x9,5	8
7200.401	Clampprofile 1mm white	0.1



INCLUDE INSPECTION REPORT | ○ All measures | ○ Measures marked with & | ○ None

Revisions | Mat.: | Toler.: | Finish.: | Ra.:

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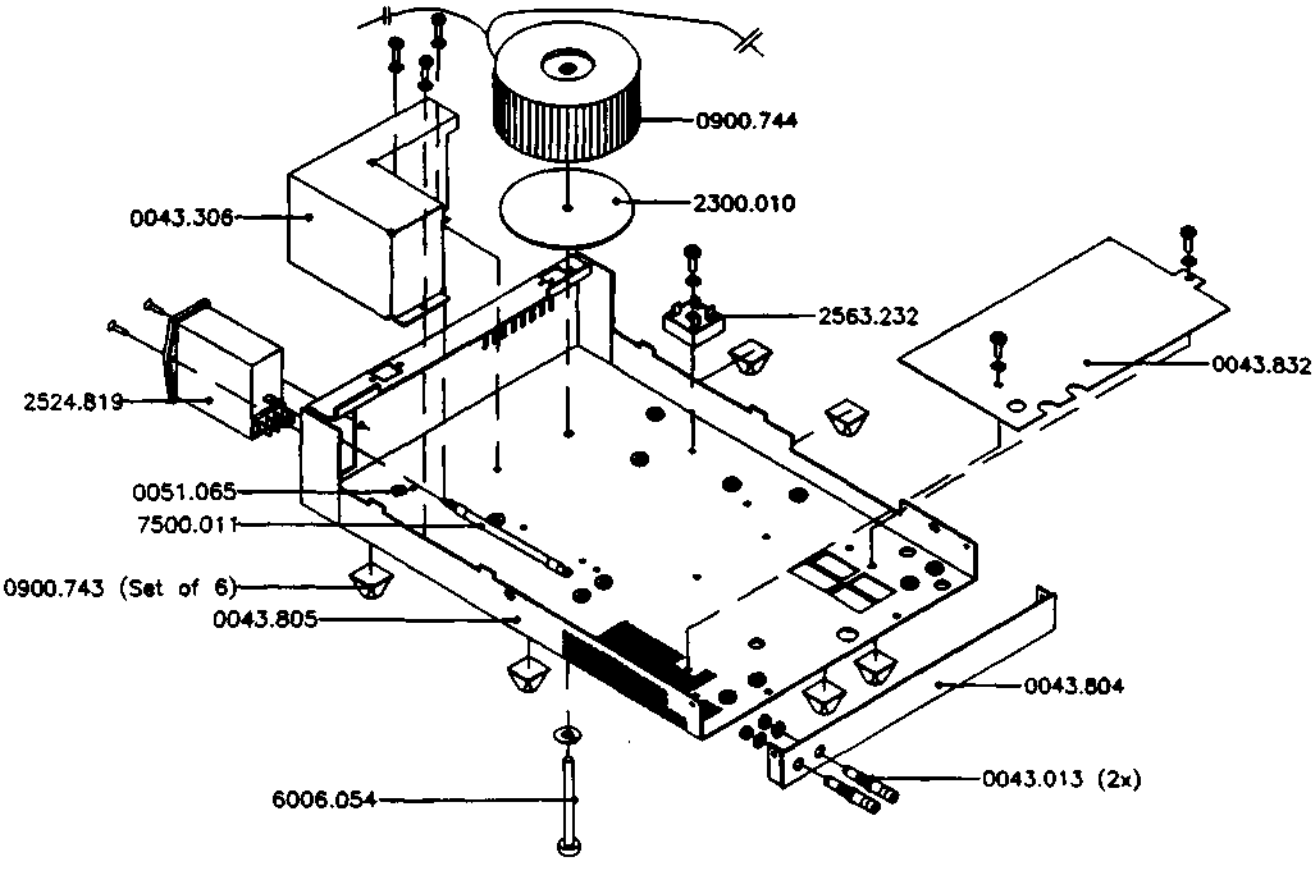
Title: Keyboard Assy 0920

Drawn: GSC		Sheet:	Drawing nr.:	A	Rev.:
Appr'd:	1st Rev.: 28-10-97	1/1	71.0920.320.4.1		
Proj. method:	Scale:				

PARTS LIST 0920.401

P/N: 0920.401 **Bottom frame assy 0920**

Component	Description	Quantity
2050.001	Drain T connector	1
2524.819	Line voltage selector/filter/mains switch	1
2563.232	Bridge Rectifier 25A/200V	1
6006.054	Screw ELV CK-KK M6x50	1
6062.008	Nut M8	2
6076.508	Washer M8 steel	2
7100.316	PE tubing OD=9mm ID=6mm	0.5
7100.414	Silicon tubing ID=5,0 OD=8,0	0.2
7500.011	Litze cable 140mm	1
0043.013	Tube connector	2
0043.306	Line power shield	1
0043.804	Front bottom plate	1
0043.805	Bottom plate 0920	1
0043.832	Bottom cover plate	1
0051.065	Label IEC417 groundsymbol	1
0900.743	Rubber foot (selfadh.)	6
0900.744	Ringcore transformer 2x120V 30V incl. connectors	1
2300.010	Rubber disc OD=90	1
2655.250	Fuses 2,5AT (Europe)	2



INCLUDE INSPECTION REPORT ○ All measures ○ Measures marked with ○ None

Mat.:

Finish.:

Toler.:

Ra.:

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Title:

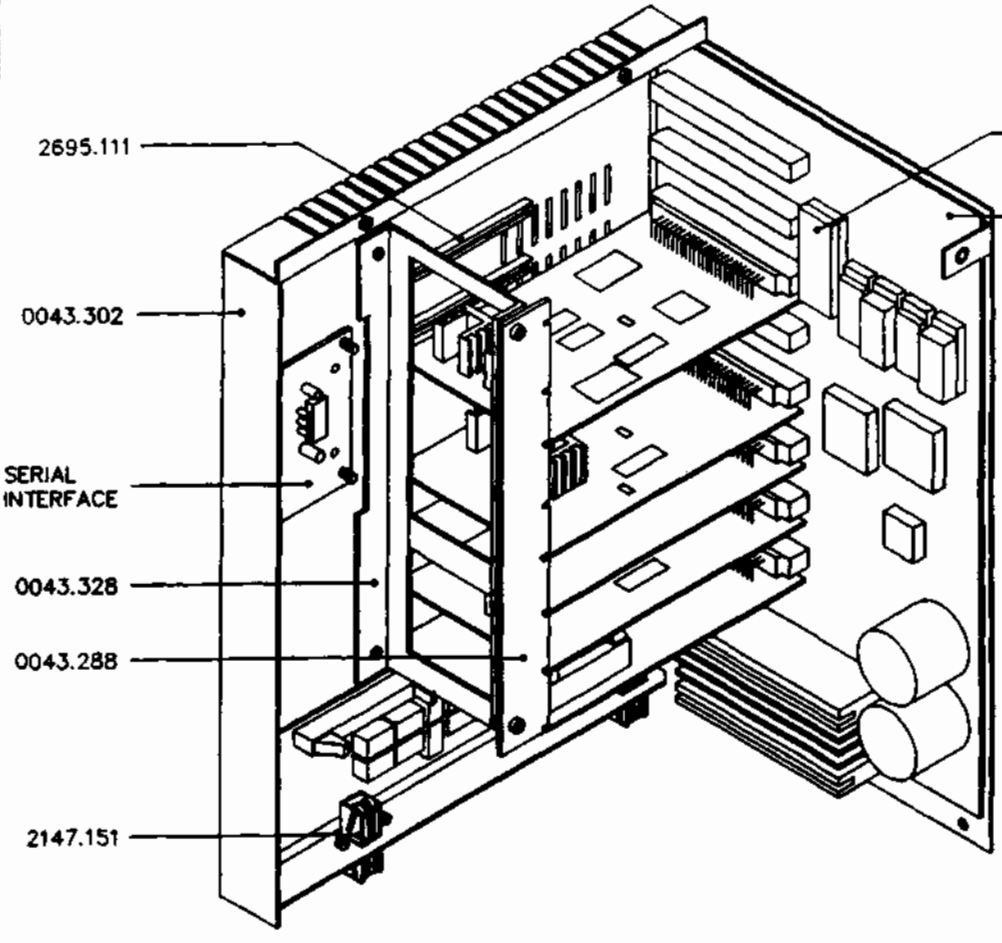
Bottom Frame Assy 0920

Drawn: GSC		Sheet:	Drawing nr.:	A	Rev.:
Appr'd:	1st Rev.:28-10-97	1/1	71.0920.401.4.1		
Projmethod:	Scale:				

PARTS LIST 0920.402

P/N: 0920.402 **Rear Panel Sub Assy 0920**

Component	Description	Quantity
0043.288	Slotstrip	1
0043.302	Backpanel	1
0043.328	PCB lock	1
0043.338	Connector plate RS 232 (25p)	1
0051.068	CE-label	1
0051.071	Caution label	1
0900.610	Tray drive PCB	1
0900.611	Syringe PCB	1
0900.630	Valve unit PCB	1
0900.640	I/O PCB	1
0900.650	RS 232 Interface PCB	1
0900.670	Backpanel I/O connectors PCB	1
0900.801	Flatcable I/O	1
0900.803	Interface flatcable assy	1
0920.620	Needle unit PCB 0920	1
0920.770	CPU/bus PCB Endurance	1
2147.151	Hinge	2
2147.359	Nylon washer M3	9
2524.141	Screwlock female pair	6
2695.111	PCB support strip 4"	5
6759.030	Flatcable clamp	1
7200.405	Protection profile 8mm black	0.1



0900.610 TRAY PCB
0900.611 SYRINGE PCB
0920.612 FEEDER PCB 1 LIFTS*
0920.613 FEEDER PCB 2 ROTOR *
0920.620 NEEDLE UNIT PCB
0900.630 INJECTION VALVE PCB
0900.632 INJECTION VALVE+ ISS VALVES + SSV VALVES *
0900.640 I/O BOARD
0900.650 INTERFACE PCB RS 232
0900.660 PELTIER COOLING PCB *
0900.670 BACK PANEL I/O CONNECTORS PCB
0920.770 CPU PCB incl. firmware & EPLD "spark version"

* Only present when option is installed

INCLUDE INSPECTION REPORT: ○ All measures ○ Measures marked with ○ None

Revision | Mat.: | Toler.:
Finish: | Ra.:

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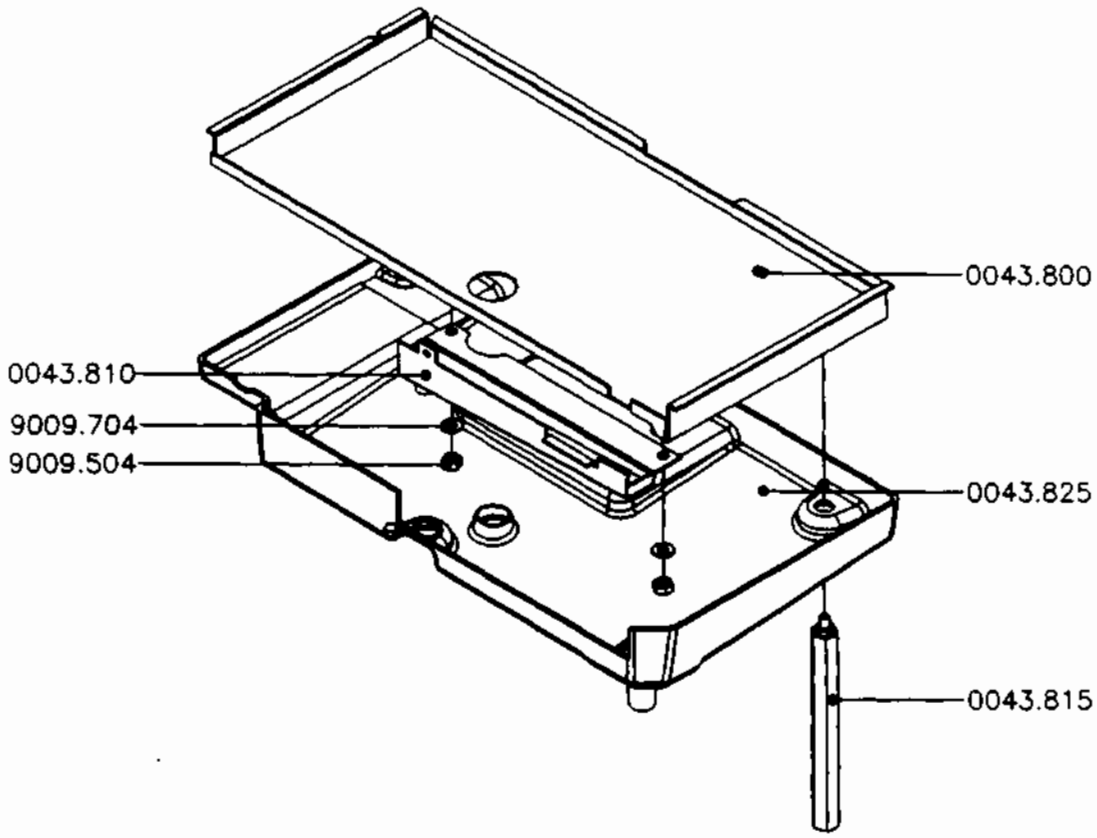
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Drawn: GSC		Sheet:	Drawing nr.:	A	Rev.:
Appr'd:	1st Rev.: 28-10-97	1/1	71.0920.402.4.2		
Proj.method:	Scale:				

PARTS LIST 0920.405

P/N: 0920.405 Sliding Plate Assy

Component	Description	Quantity
0043.800	Sliding plate	1
0043.810	SS waste basin	1
0043.815	Spacer	1
0043.825	leakage & condens basin 0920	1
9009.504	Nut SS M4	2
9009.704	Spring washer SS M4	2



INCLUDE INSPECTION REPORT	○ All measures	○ Measures marked with &	○ None
Revisions	Mat.:		Toler.:
	Finish:		Ra.:

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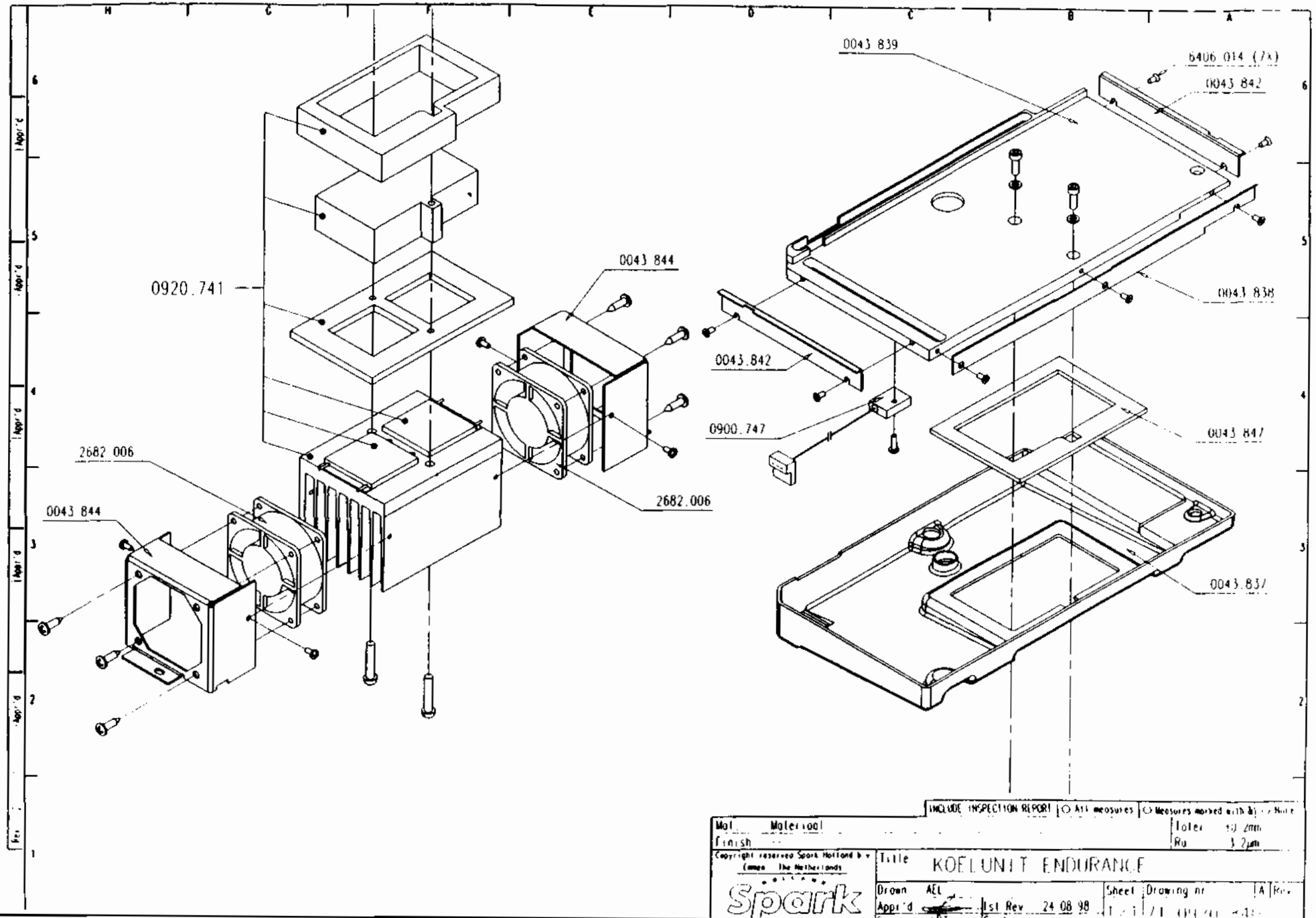
Title: Sliding Plate Assy 0920

Drawn: GSC		Sheet:	Drawing nr.:	A	Rev.:
Appr'd:	1st Rev.: 28-10-97	1/1	71.0920.405.4.1		
Proj. method:	Scale:				

PARTS LIST 0920.840

P/N: 0920.840 Cooling Option

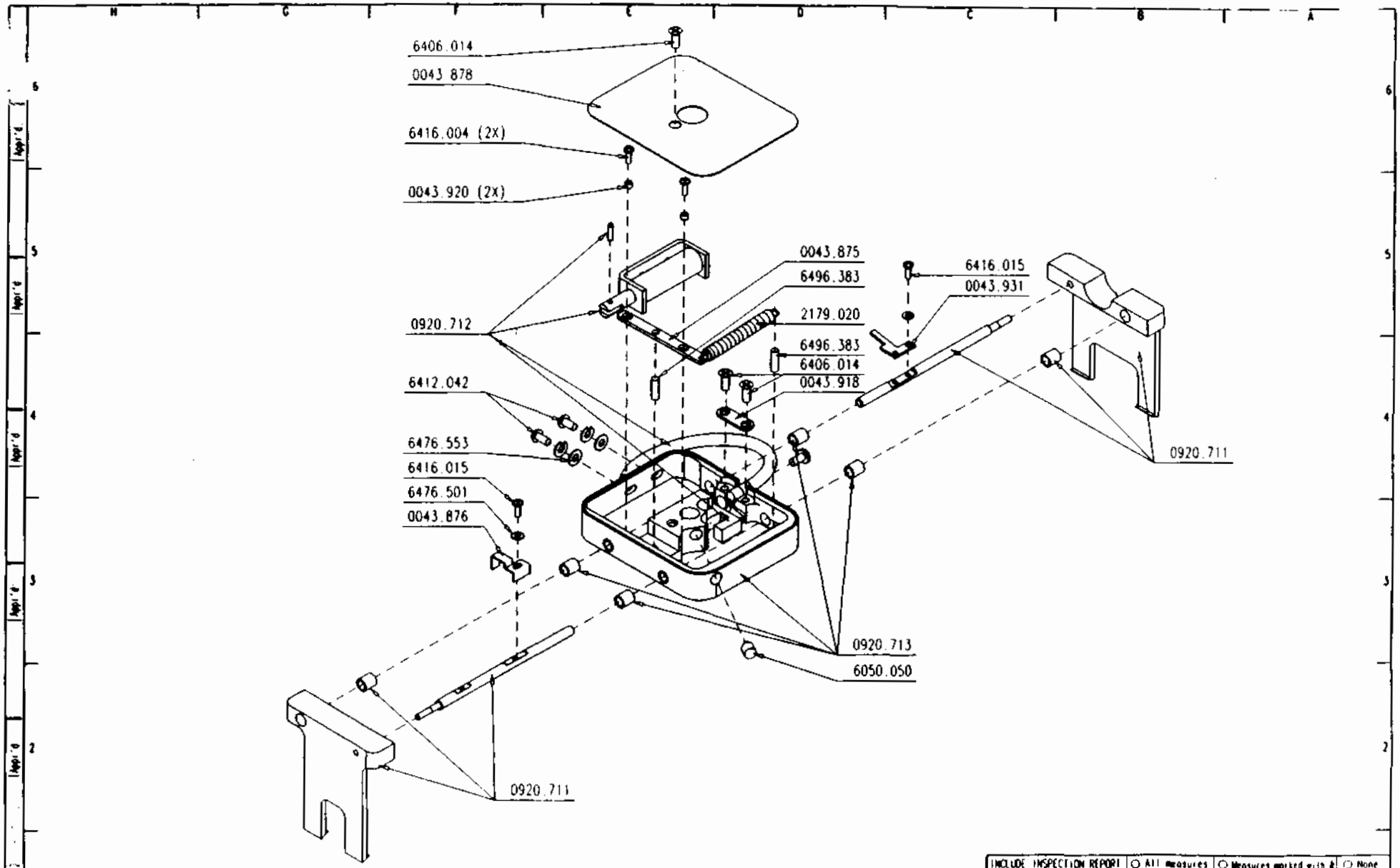
Component	Description	Quantity
0043.837	Leaking basin	1
0043.838	Front guiding strip	1
0043.839	Cool sliding plate	1
0043.842	Side guiding strip	2
0043.844	Fan cabinet	2
0043.847	Insulation leaking basin	1
0043.849	Insulation air circulation	1
0051.085	Cool option label	1
0900.660	Peltier PCB	1
0900.747	Temp. sensor assy	1
0920.313	Plate holder tray cool	1
0920.741	Replacement peltier assy 0920	1
2147.154	Fan grid	1
2682.006	Fan Papst 614	1
2695.111	PCB support strip	1
6006.021	Screw ELV CK-KK M3x30	3
6406.014	SS screw VK-KK M3x6	7
6406.126	SS screw VK-KK M4x12	3
6409.035	Screw SS CK-BZK M3x12	1
6409.094	Screw CK-BZK M4x12	2
7100.418	Silicone tubing ID=7 OD=10	1.2MT


0043 839
6406 014 (7x)
0043 842
0043 844
0920.741
0043 838
0043.842
0900.747
0043 847
2682 006
2682.006
0043 844
0043 837
INCLUDE INSPECTION REPORT
All measures
Mat Materiaal
Finish
Title KOELUNIT ENDURANCE
Drawn AEL
Appr'd
1st Rev 24 08 98
Sheet
Drawing nr
Spark

PARTS LIST 0920.850

P/N: 0920.850 Feeder Grabber

Component	Description	Quantity
0043.875	Lever arm	1
0043.876	Sensor vane grabber	1
0043.878	Cover grabber	1
0043.918	Cable clamp	1
0043.920	Bearing bush	1
0920.711	Grabber clamp assy	1
0920.712	Grabber cable incl. sensor and solenoid	1
0920.713	Base plate grabber assy	1
2179.020	Spring Z-027-A	1
6050.050	Setscrew M5x6	1
6406.014	Screw SS VK-KK M3x6	3
6412.042	Hex screw SS LBK-BZK M3x6	2
6416.003	Screw SS CK-KK M2x4	1
6416.004	Screw SS CK-KK M2x6	2
6476.501	Washer SS A2 M2	1
6476.553	Washer SS M3 9x3 2x8mm	2
6496.383	Davel pin	2



INCLUDE INSPECTION REPORT | ○ All measures | ○ Measures marked with a | ○ None

Mat. Materiaal | Toler. ±0.2mm

Finish. --- | Ra 3.2µm

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Title FEEDER GRABBER

Drawn AEL | Sheet | Drawing nr | A | Rev.

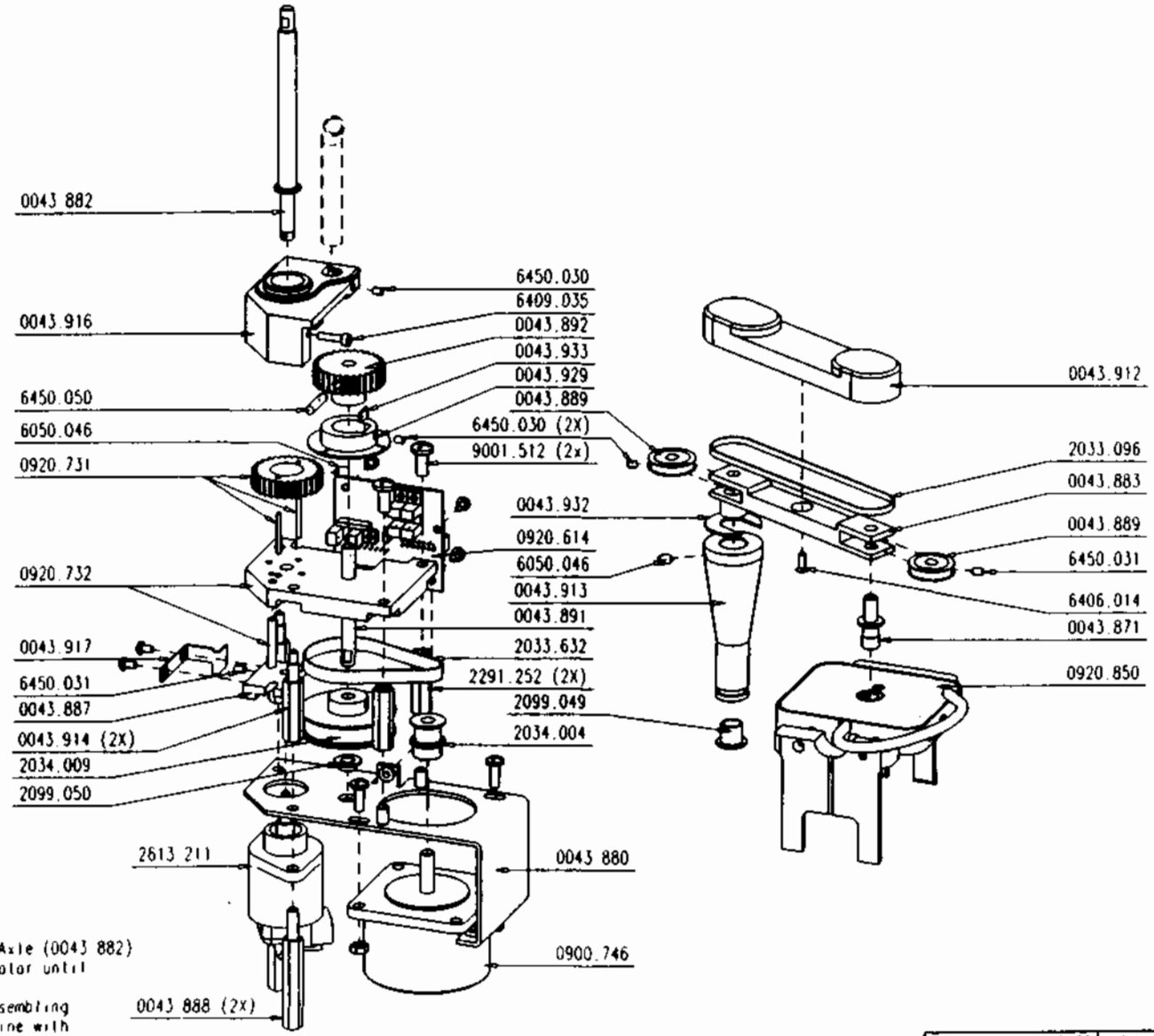
Appr'd | 1st Rev 18-11-98 | 1 / 1

Scale

PARTS LIST 0920.851

P/N: 0920.851 Feeder arm assembly

Component	Description	Quantity
0043.871	Rotating pin feeder arm	1
0043.880	Motor frame feeder arm	1
0043.882	Up-down sensor vane	1
0043.883	Rotating arm	1
0043.887	Sensor vane mounting plate	1
0043.888	Spacer male/female M5/M4	1
0043.889	Geared wheel 31T MXL012	2
0043.891	Gear wheel axle	1
0043.892	Gear wheel with collar	1
0043.912	Cover plate feeder arm	1
0043.913	Rotation bush	1
0043.914	Spacer male/female M4/M5	1
0043.916	Bearing house feeder arm	1
0043.917	Sensor vane up-down movement	1
0043.929	Sensor disc feeder arm	1
0900.746	Replacement Steppermotor Assy 1.05A	1
0920.614	Feeder arm PCB	1
0920.731	Gear wheel with pins	1
0920.732	Bearing plate feeder assy	1
0920.803	Cable up/down motor	1
0920.850	Gripper assembly	1
2033.096	Geared belt 960MXL 012	1
2033.632	Geared belt 632 MXL 025	1
2034.004	Pulley PLA 18	1
2034.009	Pulley PLB 60 MXL 025 6WF	1
2099.049	Slide bearing iglidur GFM-081014-10	1
2291.252	Distance bush M5x30	2
2613.211	Stepper motor Sonceboz 7213	1
6050.046	Setscrew with stud	2
6409.035	SS screw CK-BZK M3x12	1
6450.030	SS setscrew M3x4	1
6450.031	Setscrew conical M3x6	2
6450.050	Setscrew SS M4x16	1
9001.512	Screw EVRZ CK-KK M5x12	2



Assembling Instructions

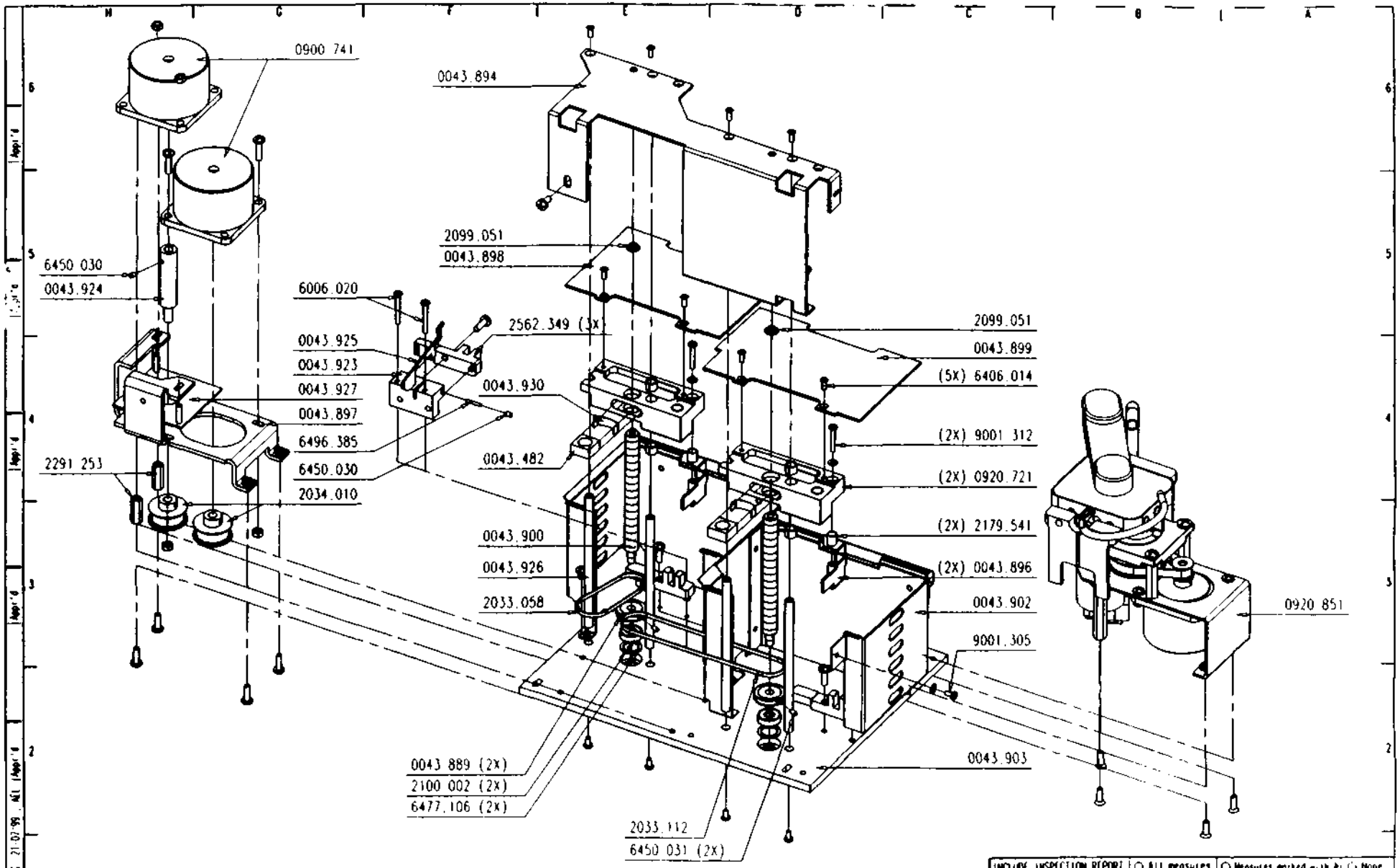
Mount motor (2613.211) on Axle (0043 882) by rotating the complete motor until the motor blocks.
Reverse the motor until assembling holes of the motor are inline with the holes of the motor frame

INCLUDE INSPECTION REPORT	○ All measures	○ Measures marked with ø	○ None
Mat Material		Toler ±0.2mm	
Finish --		Rg 3.2µm	
Copyright reserved Spark Holland b.v. Emmen The Netherlands	Title FEEDER-ARM		
Spark	Drawn AEL	Sheet	Drawing nr A Rev
	Appr'd	1/1	
	1st Rev. 26-08-1998		
	Prod method Scale		

PARTS LIST 0920.852

P/N: 0920.852 Feeder Lift assemby

Component	Description	Quantity
0043.482	Union nut M10	2
0043.889	Gear wheel 31T MXL012	2
0043.894	Bearing block spindles	1
0043.896	Lift sensor vane	2
0043.897	Motor frame feeder	1
0043.898	Lift plate left	1
0043.899	Lift plate right	1
0043.900	Lift spindle	2
0043.902	Feeder frame	1
0043.903	Feeder feetplate	1
0043.923	Hinge block	1
0043.924	Extension shaft	1
0043.925	Plate dectection sensor vane	1
0043.926	Guiding shaft	4
0043.927	Motor assembling plate	1
0043.930	Nut M10 leaf spring	1
0900.741	Replacement steppermotor assy	2
0920.721	Lift Guiding block assy	2
0920.805	Cable set feeder lifts	1
2033.058	Geared belt 584 MXL 012	1
2033.112	Geared belt 1120 MXL 012	1
2034.010	Pulley PLA36 MXL 025	2
2099.051	Slide bearing	2
2100.002	Groove ball bearing	2
2179.523	Compression spring	1
2291.253	Distance bush	2
2562.349	Opto interruptor	3
6006.020	Screw CK-KK M3x25	2
6406.014	Screw SS VK-KK M3x6	4
6450.030	Setscrew SS M3x4	2
6450.031	Setscrew SS M3x6 cone point	2
6477.106	Wave ring SS	2
6496.385	Pin SS 2x12mm	1
9001.312	Screw CK-KK M3x12	2



INCLUDE INSPECTION REPORT | ○ All measures | ○ Measures marked with Ø | ○ None

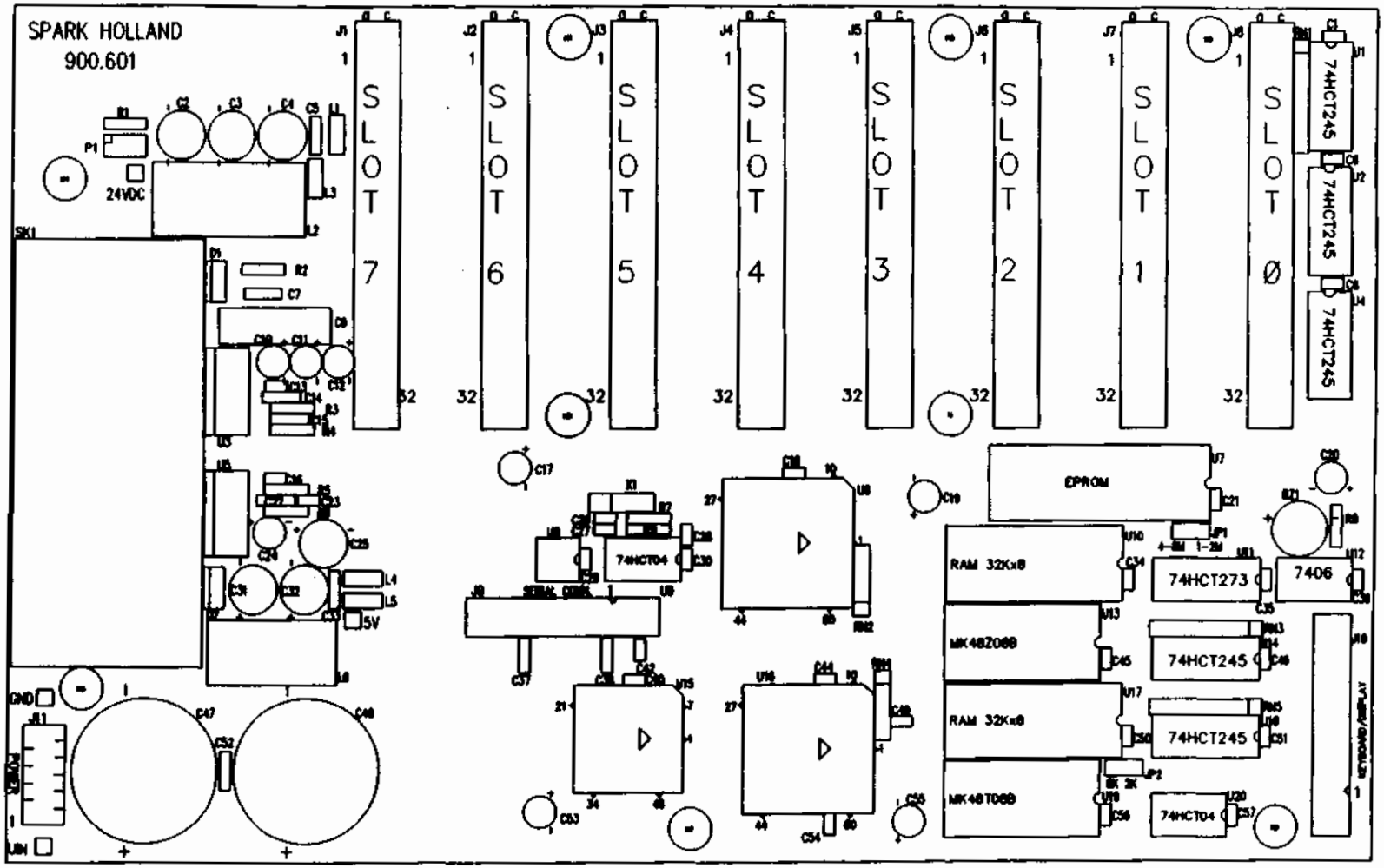
Mat Material
Finish
Toler ±0.2mm
Ra 3.2µm

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Spark

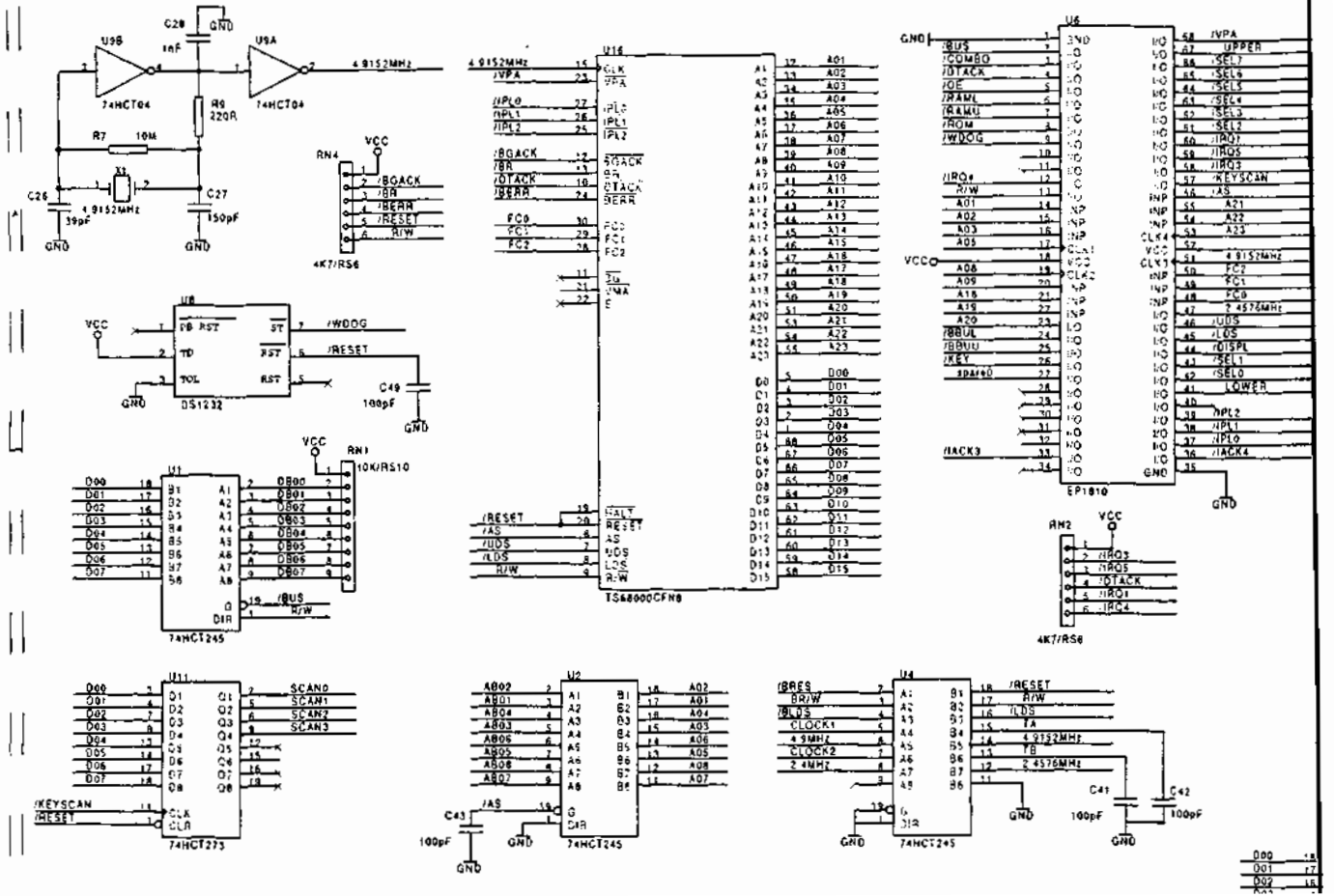
Title FEEDER ENDURANCE

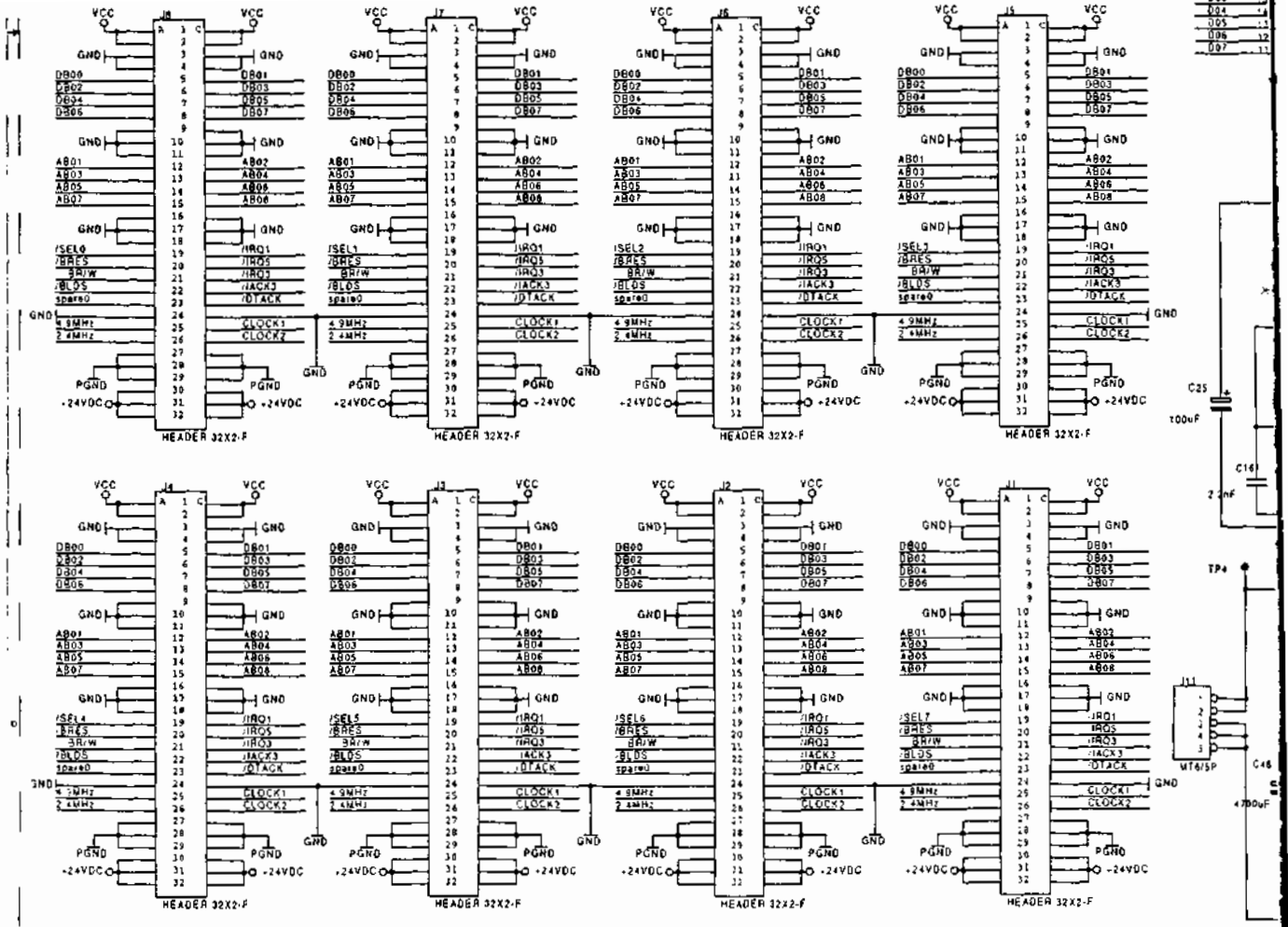
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Appr'd
1st Rev. 20-10-98
Scale 1:1
Sheet 1/1
Drawing nr
A
Rev

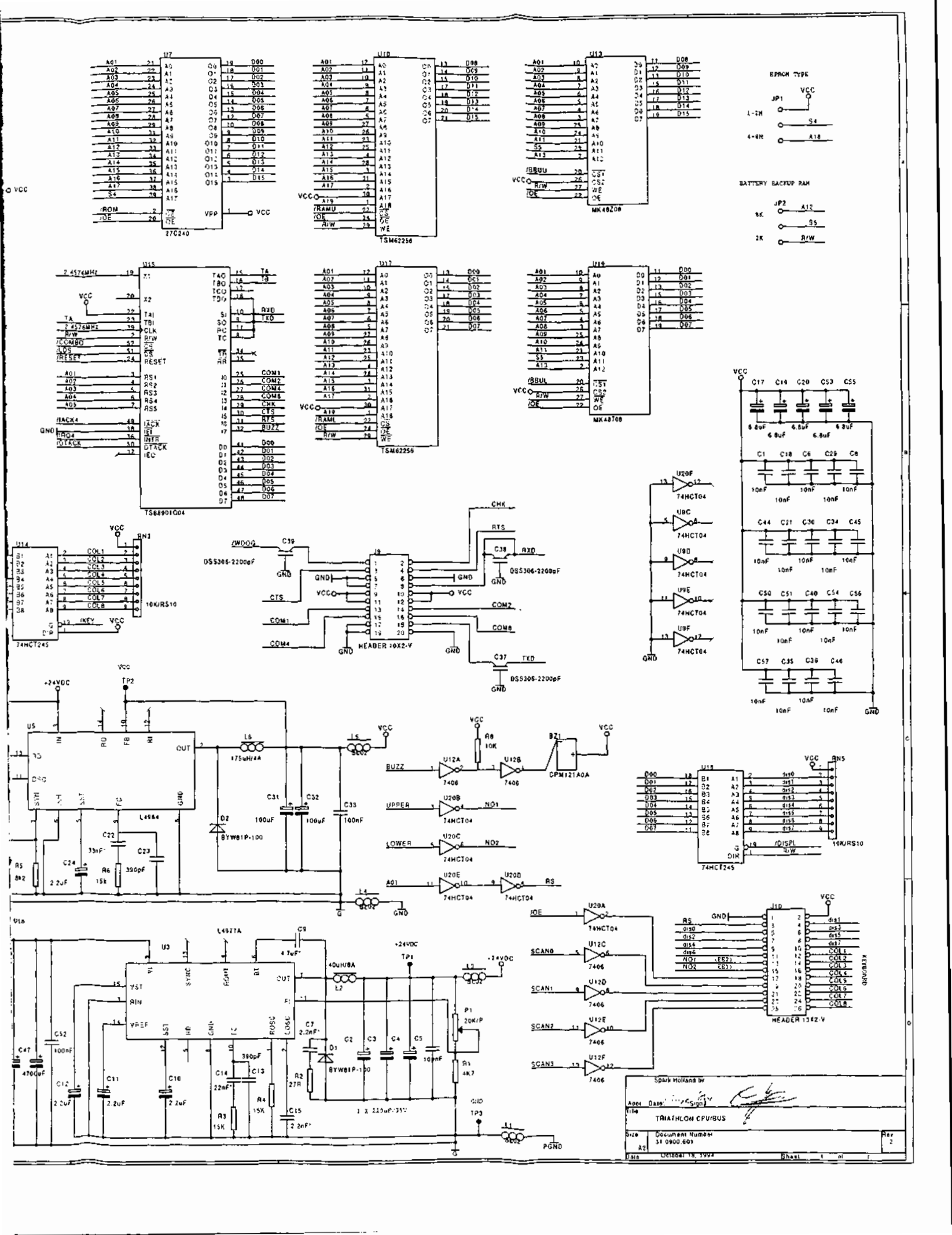


JUMPER SETTINGS:
JP1= 4-8M
JP2=8K

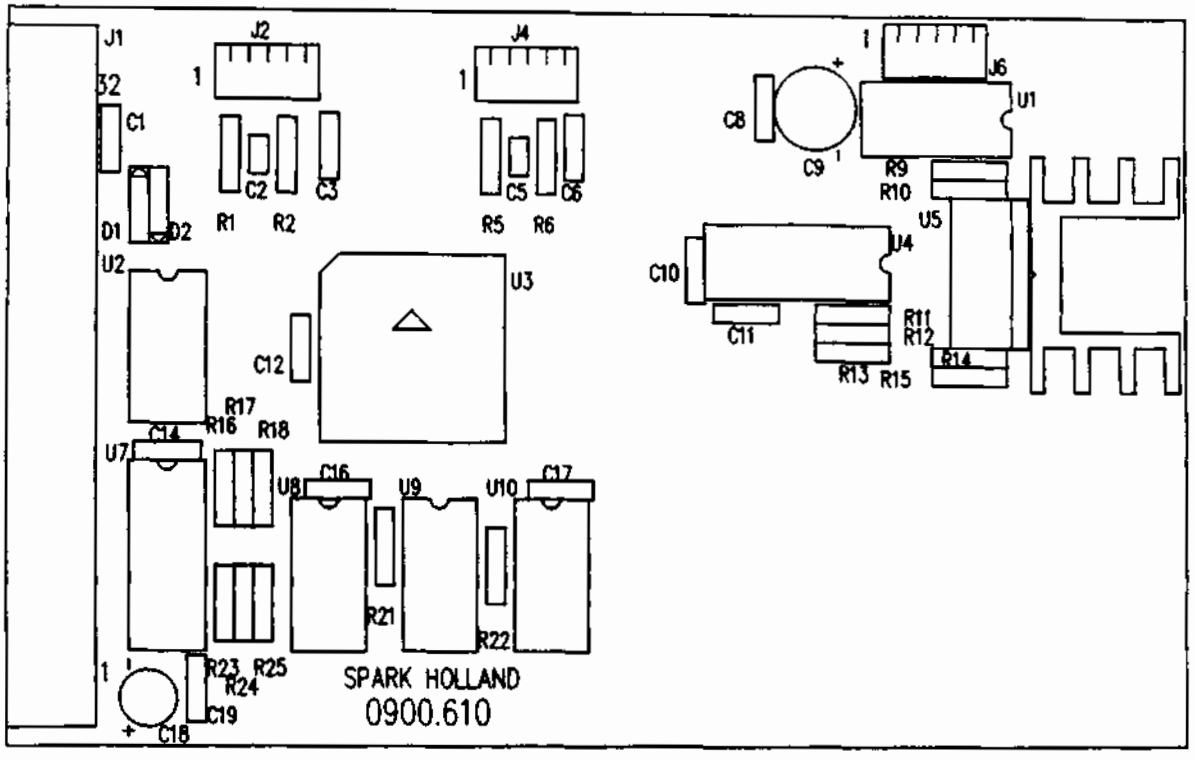
Mat.:			Toler.:
Finish.:			Rs.:
Copyright reserved Spark Holland b.v. Enschede, the Netherlands	Title: CPU PCB 920		
Spark Holland	Drawn: GSC	Sheet: 1/1	Drawing nr.: 71.09[illegible].770 3.1
	Appr'd: Init. Rev.: 11-02-98		A Rev.
	Pr		


U9B
U9A
74HCT04
C29
18F
4.9152MHz
R6
220R
R7
10M
X1
C26
39pF
C27
150pF
GND
VCC
RN4
/BGACK
/BR
/BERR
/RESET
R/W
4K7/RS6
U8
DS1232
/WDOG
C49
100pF
U1
74HCT245
RN1
10K/RS10
/BUS
U16
TS68000CFN8
/VPA
/IPL0
/IPL1
/IPL2
/BGACK
/BR
/DTACK
/BERR
FC0
FC1
FC2
/AS
/UDS
/LDS
R/W
/HALT
U6
EP1810
/BUS
/COMBO
/DTACK
/OE
/RAML
/RAMU
/ROM
/WDOG
/IRQ4
/IACK3
/VPA
/UPPER
/SEL7
/SEL6
/SEL5
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/SEL3
/SEL2
/IRQ7
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/IRQ3
/KEYSCAN
/AS
A21
A22
A23
4.9152MHz
FC2
FC1
FC0
2.4576MHz
/UDS
/LDS
/DISPL
/SEL1
/SEL0
LOWER
/IPL2
/IPL1
/IPL0
/IACK4
RN2
/IRQ3
/IRQ5
/DTACK
/IRQ1
/IRQ4
4K7/RS6
U11
74HCT273
SCAN0
SCAN1
SCAN2
SCAN3
/KEYSCAN
/RESET
U2
74HCT245
C43
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U4
/BRES
R/W
/LDS
CLOCK1
4.9MHz
CLOCK2
2.4MHz
/RESET
R/W
/LDS
YA
4.9152MHz
YB
2.4576MHz
C41
100pF
C42
100pF


J8
J7
J6
J5
J4
J3
J2
J1
HEADER 32X2-F
VCC
GND
PGND
+24VDC
-24VDC
DB00
DB01
DB02
DB03
DB04
DB05
DB06
DB07
AB01
AB02
AB03
AB04
AB05
AB06
AB07
AB08
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/SEL5
/SEL6
/SEL7
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/IRQ1
/IRQ5
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/IACK3
/DTACK
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2.4MHz
CLOCK1
CLOCK2
C25
1000uF
C161
2.2nF
TP4
J11
MT6/5P
C46
4700uF


U7
27C240
U10
TSM62256
U13
MK48Z08
EPROM TYPE
JP1
VCC
1-2M
2-4M
S4
A18
BATTERY BACKUP RAM
JP2
8K
2K
A12
S5
R/W
U15
TS68901CG04
U17
TSM62256
U19
MK48T08
U14
74HCT245
RN3
10K/RS10
U8
HEADER 20X2-V
C39
C38
C37
DS5306-2200pF
CHK
RTS
RXD
TXD
CTS
COM1
COM2
COM3
COM4
/WDOG
U20F
U20C
U20D
U20E
74HCT04
C17
C19
C20
C53
C55
6.8uF
C1
C18
C6
C29
C8
C44
C21
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C51
C40
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C56
C57
C35
C36
C46
10nF
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L6
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D2
BYW81P-100
100uF
100nF
U12A
U12B
7406
BZ1
CPM121A0A
BUZZ
U20B
UPPER
NO1
U20C
LOWER
NO2
U18
74HCT245
RN5
U3
L497TA
L2
40uH/8A
P1
20K/P
R1
4K7
R2
27R
D1
BYW81P-100
U20A
U12C
U12D
U12E
U12F
SCAN0
SCAN1
SCAN2
SCAN3
/OE
U19
HEADER 13X2-V
KEYBOARD
TP1
TP2
TP3
+24VDC
PGND
Spark Holland bv
TRIATHLON CPUrBUS
Document Number
31 0900.601
October 18, 1994
Sheet

NOT USED
IN 0920

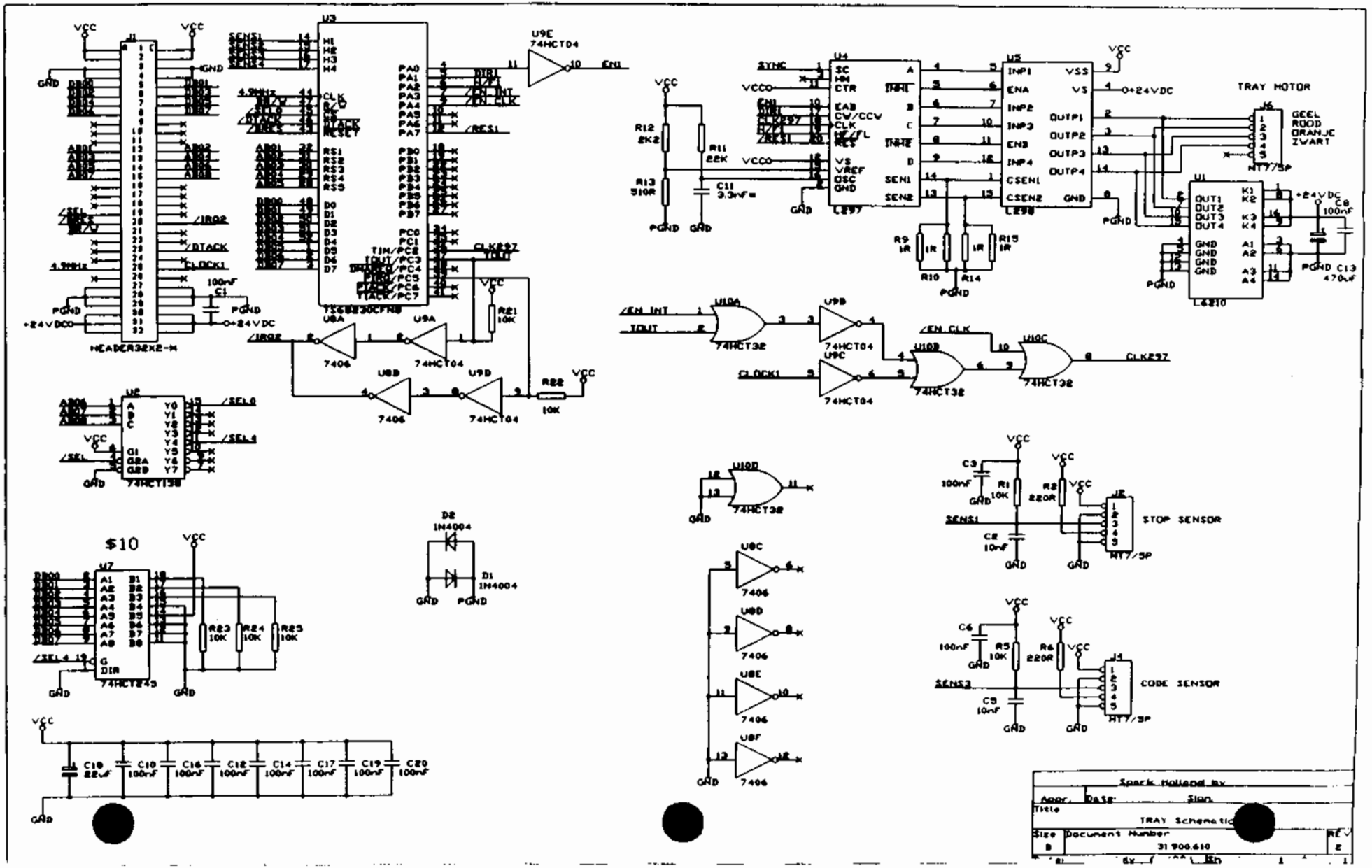


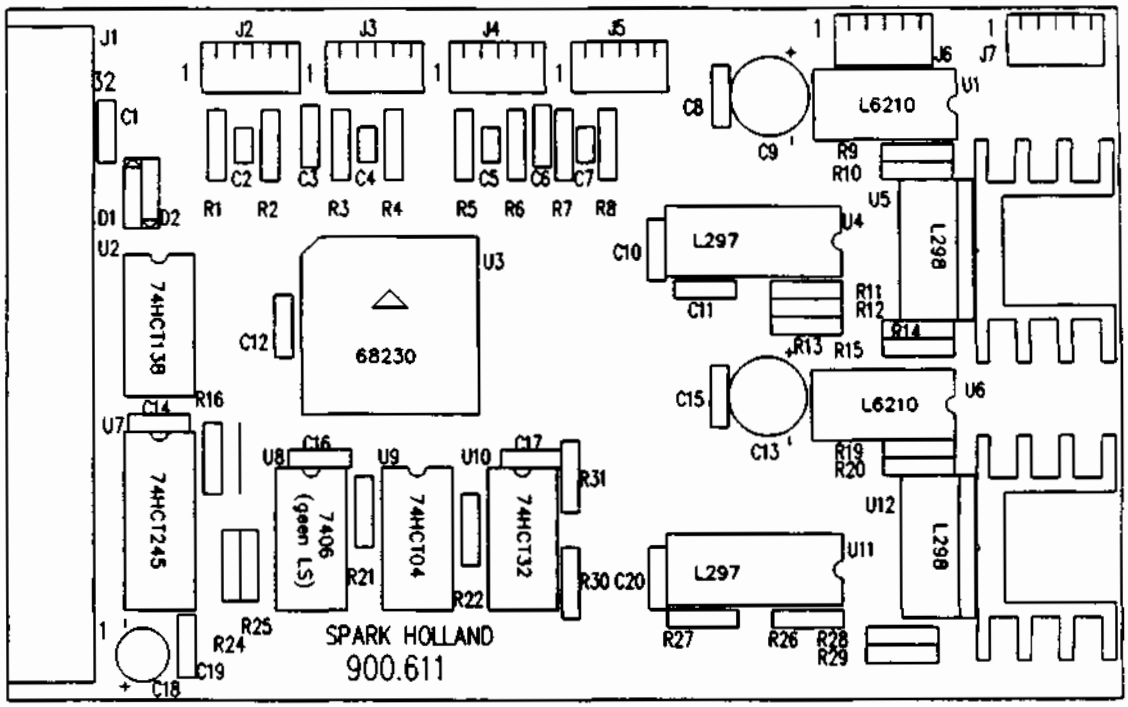
Rev.: 2 08-07-99	Mat.:		Toler.:
	Finish.:		Ra.:

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Spark Holland
INSTRUMENTS FOR HELP

Title: TRAY DRIVE PCB					
Drawn: GSC		Sheet:	Drawing nr.:	A	Rev.:
Appr'd:	1st Rev.: 130995	1/1	71.0900.610.4.2		
Proj.method:	Scale:				


TRAY MOTOR
STOP SENSOR
CODE SENSOR
TRAY Schematic
Spark Holland by
Appr.
Date
Sign
Title
Size
Document Number
31900.610
Rev
2
Sheet 1 of 1



Appr'd:

Appr'd:

Appr'd:

Appr'd:

Appr'd:

Rev.:

Mat.: | Toler.:

Finish.: | Ra.:

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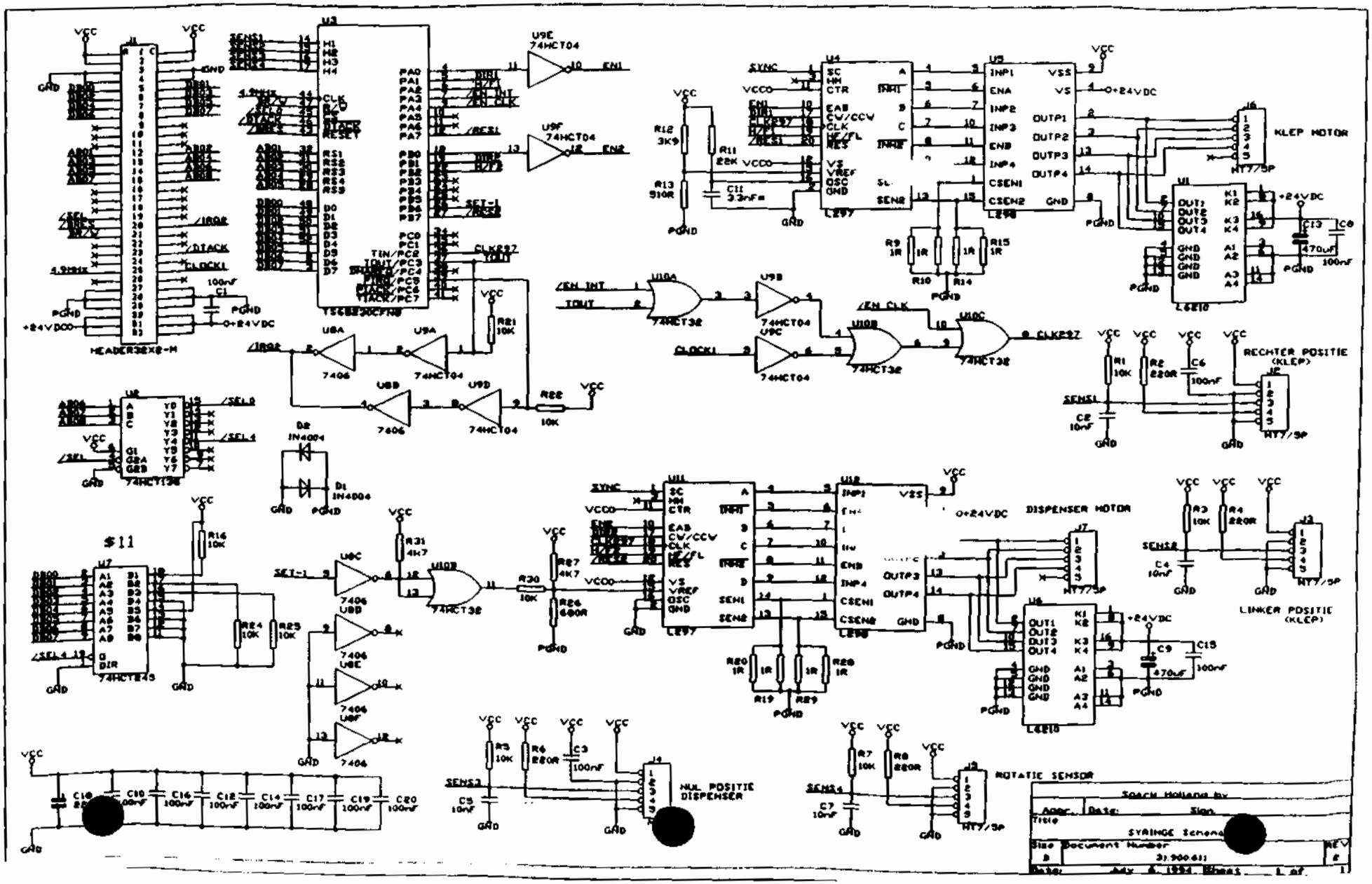
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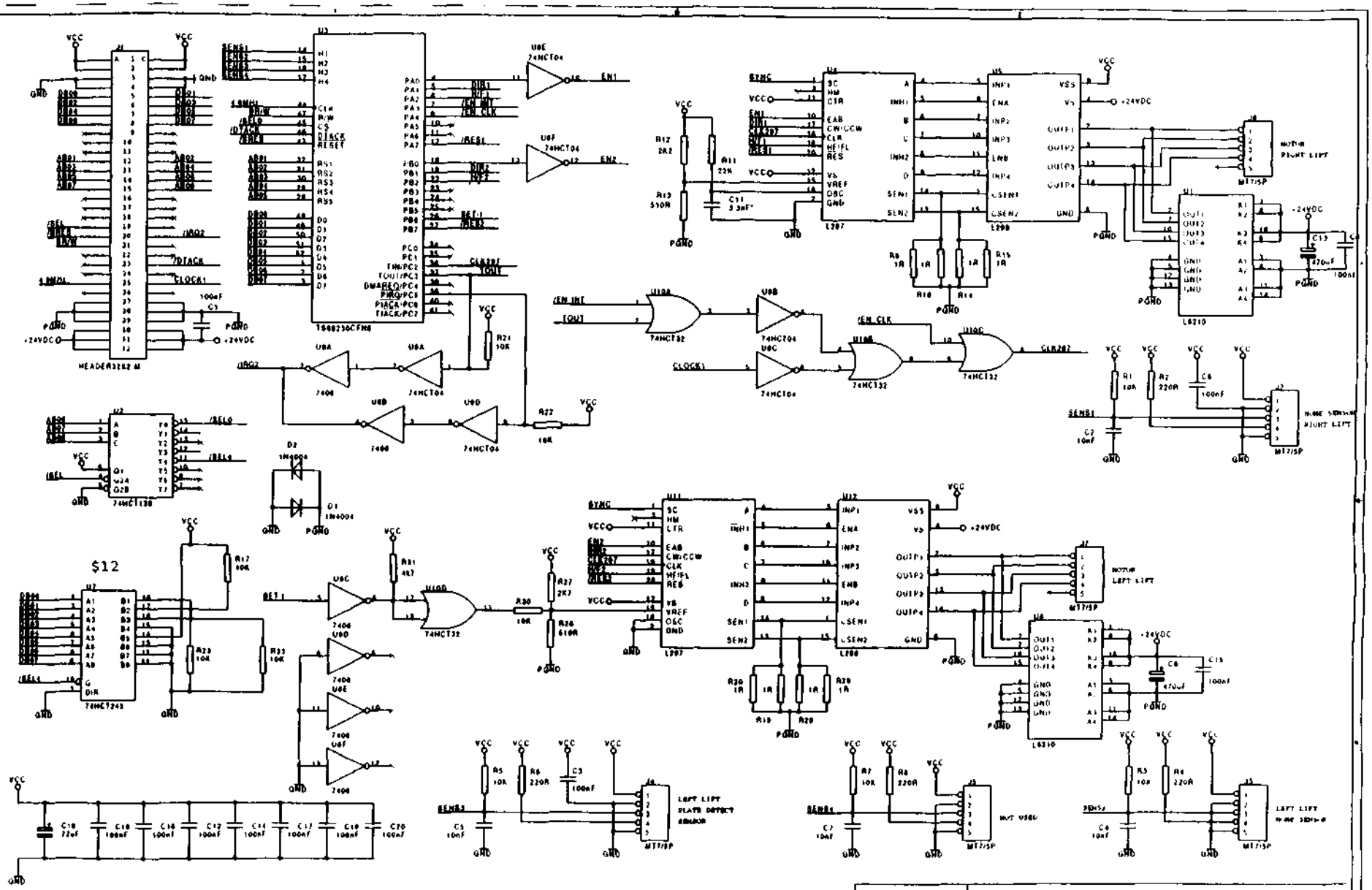
Spark Holland
INSTRUMENTS FOR HEALTH

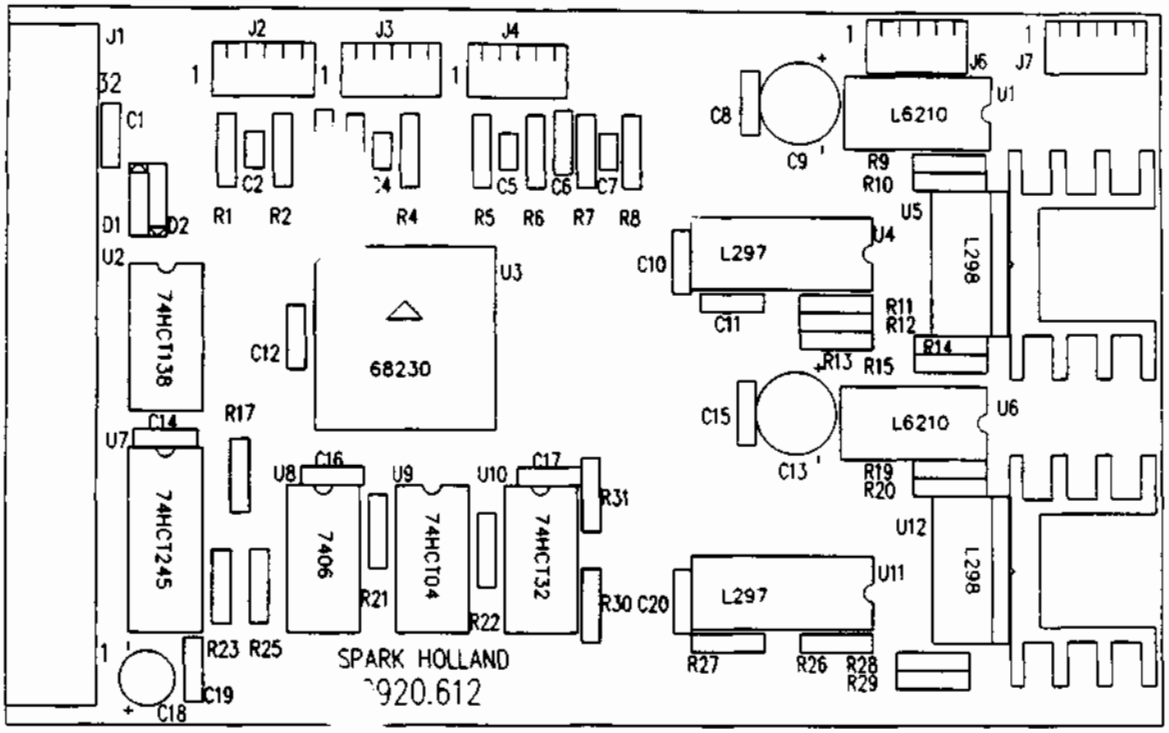
Drawn: GSC | Sheet: | Drawing nr.: | A | Rev.:

Appr'd: | 1st Rev.: 04-06-96 | 1/1 | 71 .0900.611 .4.1

Proj.method: | Scale: 1:1


HEADER36X2-M
TS68230CFN8
L297
L298
L6210
HY7/5P
KLEP MOTOR
DISPENSER MOTOR
RECHTER POSITIE (KLEP)
LINKER POSITIE (KLEP)
NUL POSITIE DISPENSER
ROTATIE SENSOR
SYRINGE Schema
Document Number
31.900.611
Sheet 1 of 1


FEEDER LIFT SCHEMATIC
SPARK HOLLAND
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Title
Drawn
Date Tuesday, September 08, 1998
Appr Date 21-9-98 Appr
Sheet 1/1
Drawing nr 31 0920 612
Rev 01
HEADER32X2 M
TS80230CFN8
74HCT138
74HCT243
74HCT04
74HCT32
7400
L297
L298
L6210
MOTOR RIGHT LIFT
MOTOR LEFT LIFT
LEFT LIFT PLATE DETECT SENSOR
+24VDC
VCC
GND
PGND



Appr'd:

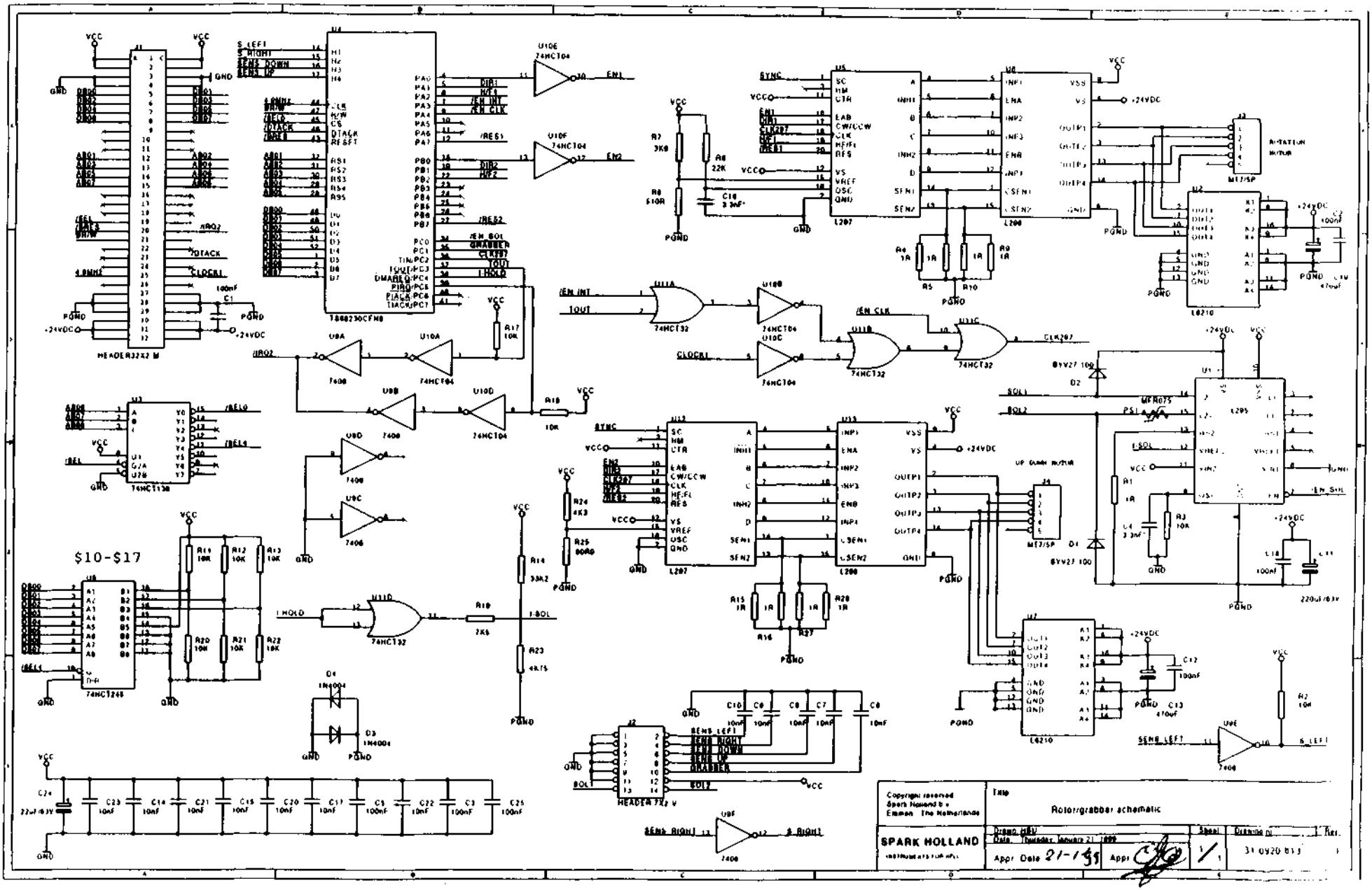
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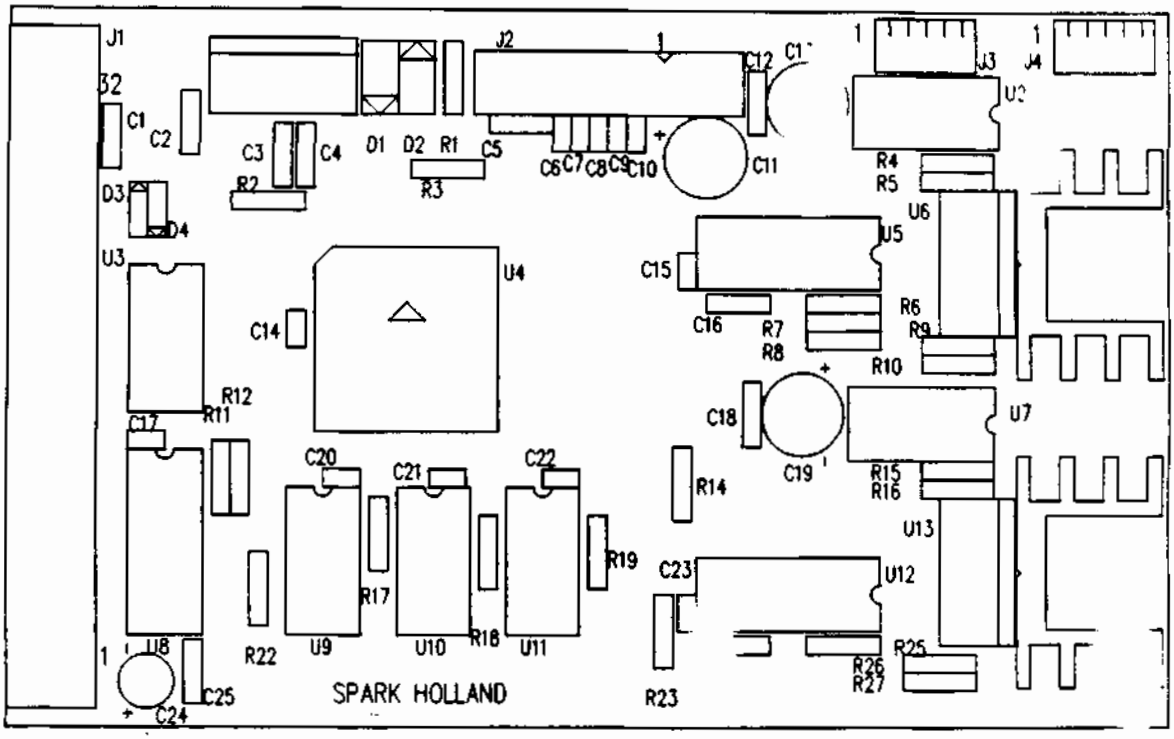
Appr'd:

Appr'd:

Rev.:

Mat.:			Toler.:
Finish.:			Ra.:
Copyright reserved Spark Holland b.v. Emmen The Netherlands	Title: FEEDER PCB 1 LIFTS		
Spark Holland INSTRUMENTS FOR HPLC	Drawn: GSC	Sheet:	Drawing nr.: A Rev
	Appr'd: 1st Rev.: 06-08-98	1/1	71.0920.612.4.1
	Proj.method: Scale:		


$10-$17
HEADER32X2 M
T8802300FN8
74HCT138
74HCT245
L6207
L6208
L6210
MT/SP
HEADER7X2 V
Copyright reserved
Spark Holland b.v.
Emmen The Netherlands
Title
Rotorgrabber schematic
SPARK HOLLAND
Drawn HBV
Date Tuesday January 21 1997
Appr Date 21-1-97
Sheet 1/1
Drawing nr 31 0920 813
Rev



Appr'd:

Appr'd:

Appr'd:

Appr'd:

Appr'd:

Revision:

INCLUDE INSPECTION REPORT	○ All measures	○ Measures marked with &	○ None

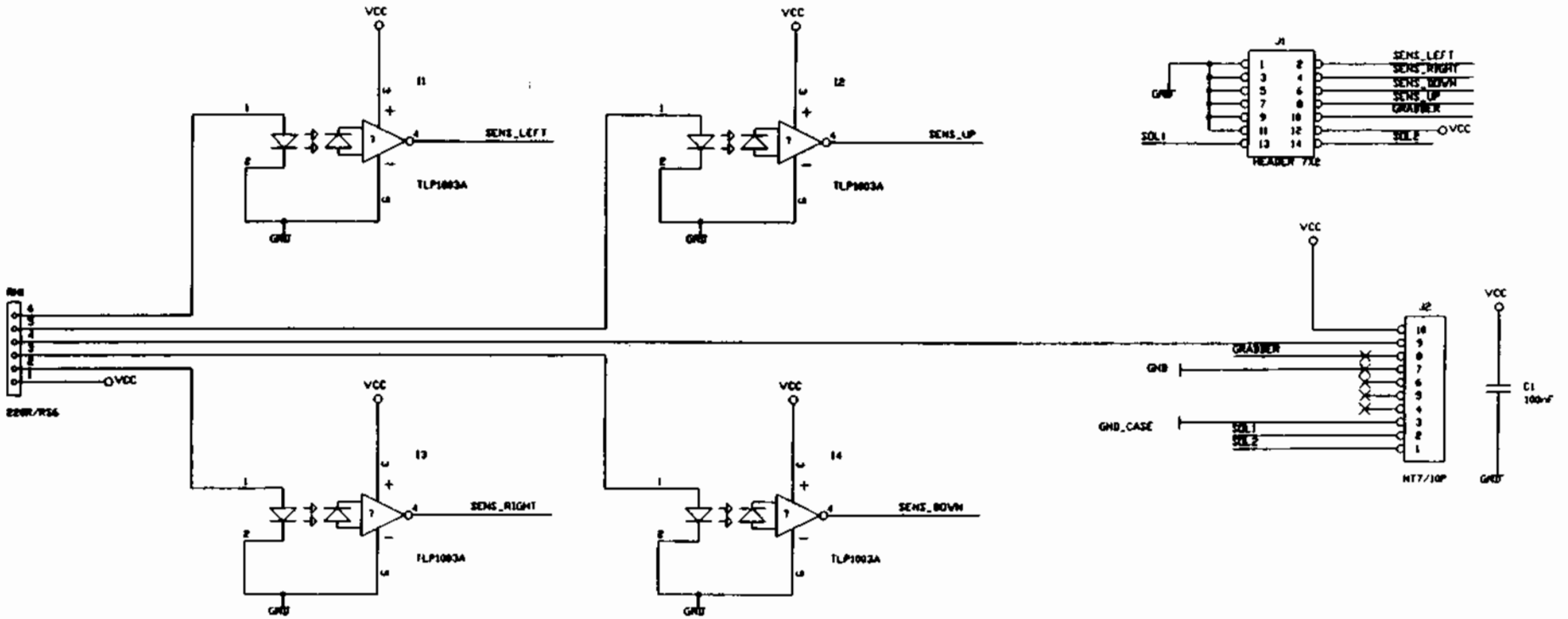
Mat.:	Toler.:
Finish.:	Ra.:

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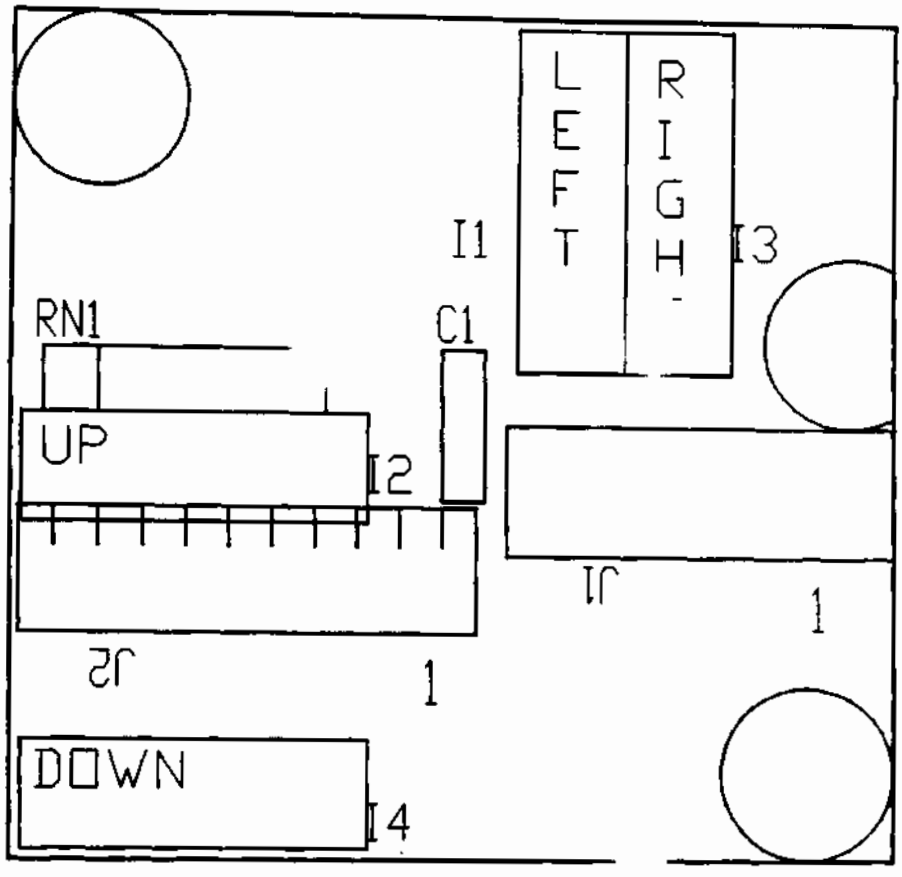
HOLLAND Spark INSTRUMENTS

Title: FEEDER PCB 2 ROTOR

Drawn: GSC		Sheet:	Drawing nr.:	A Rev.:
Appr'd:	1st Rev.: 06-08-98	1/1	71.0920.613.4.1	
Proj.method:	Scale: 1			



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Title
Feeder arm schematic
SPARK HOLLAND
Appr. Date
Appr.
31.0920.614
02



J1 and J2 on solder-side

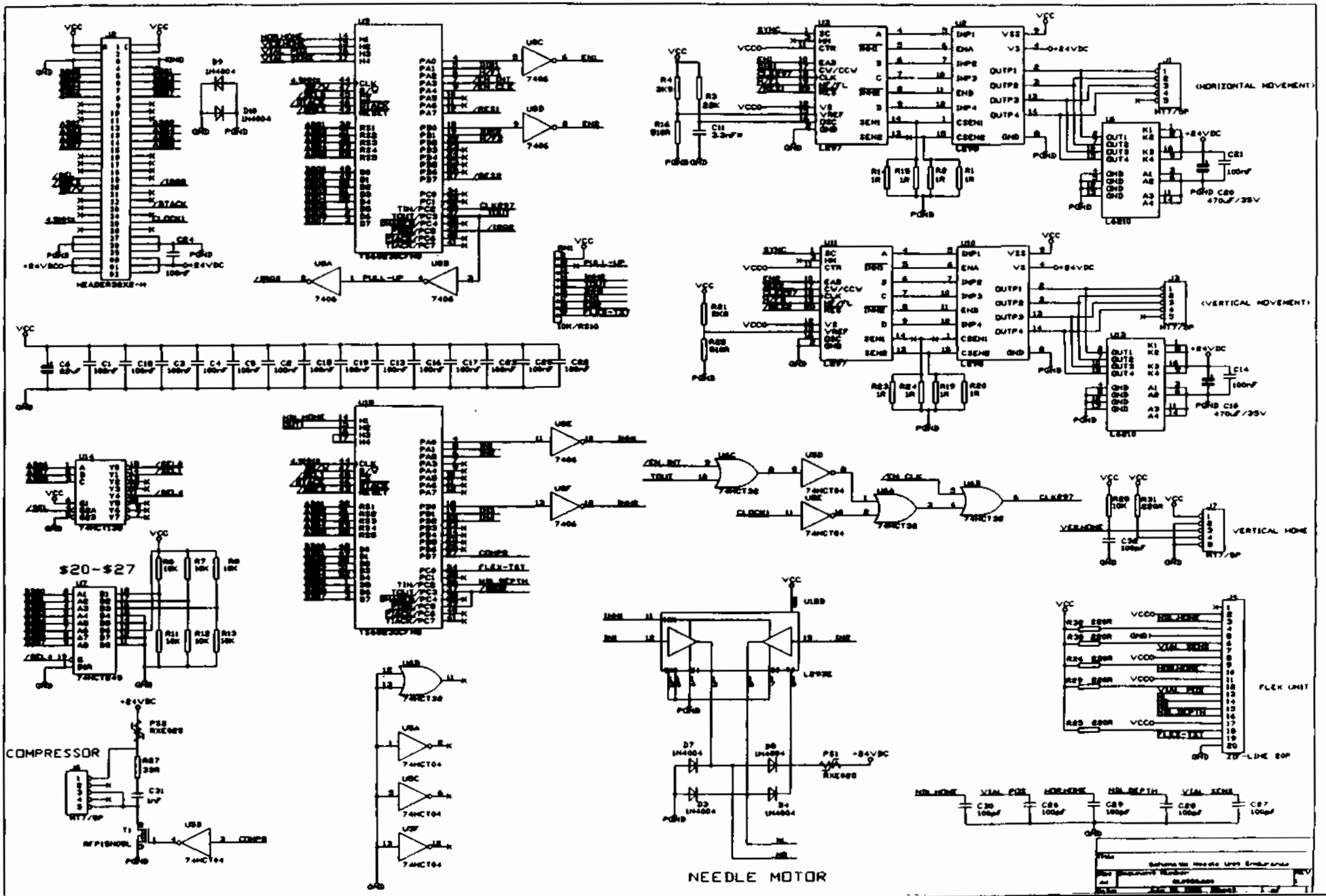
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Mat.:		Toler.:	
Finish:		Ra.:	

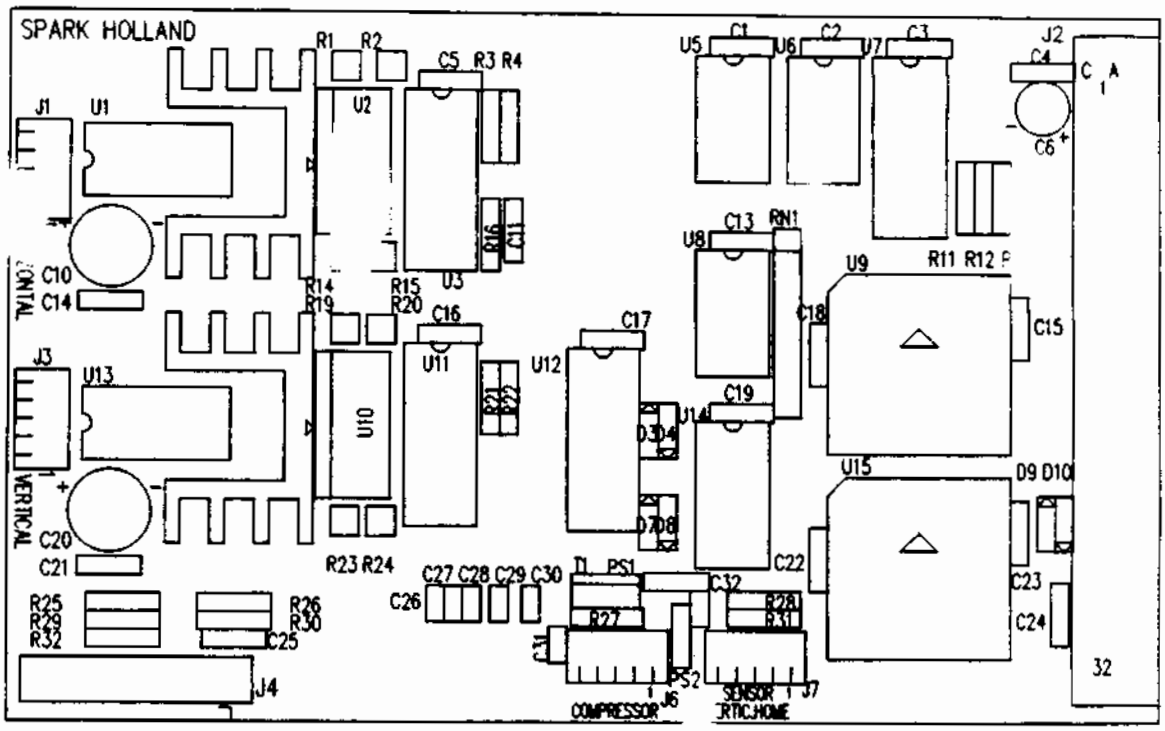
Copyright reserved Spark Holland Emmen The Netherlands

Title: Feeder arm PCB

Drawn: GSC		Sheet:	Drawing nr.:	A	Rev.:
Appr'd:	1st Rev.:09-07-99	1/1	71.0920.614.4.1		
Proj.method:	Scale: 1				

Revisions | Appr'd | Appr'd | Appr'd | Appr'd | Appr'd


HORIZONTAL MOVEMENT
VERTICAL MOVEMENT
VERTICAL HOME
$20-$27
COMPRESSOR
NEEDLE MOTOR
FLEX UNIT



INCLUDE INSPECTION REPORT	○ All measures	○ Measures marked &	○ None

Revision: | Appr'd: | Appr'd: | Appr'd: | Appr'd: | Appr'd:

Mat.: | Toler.:

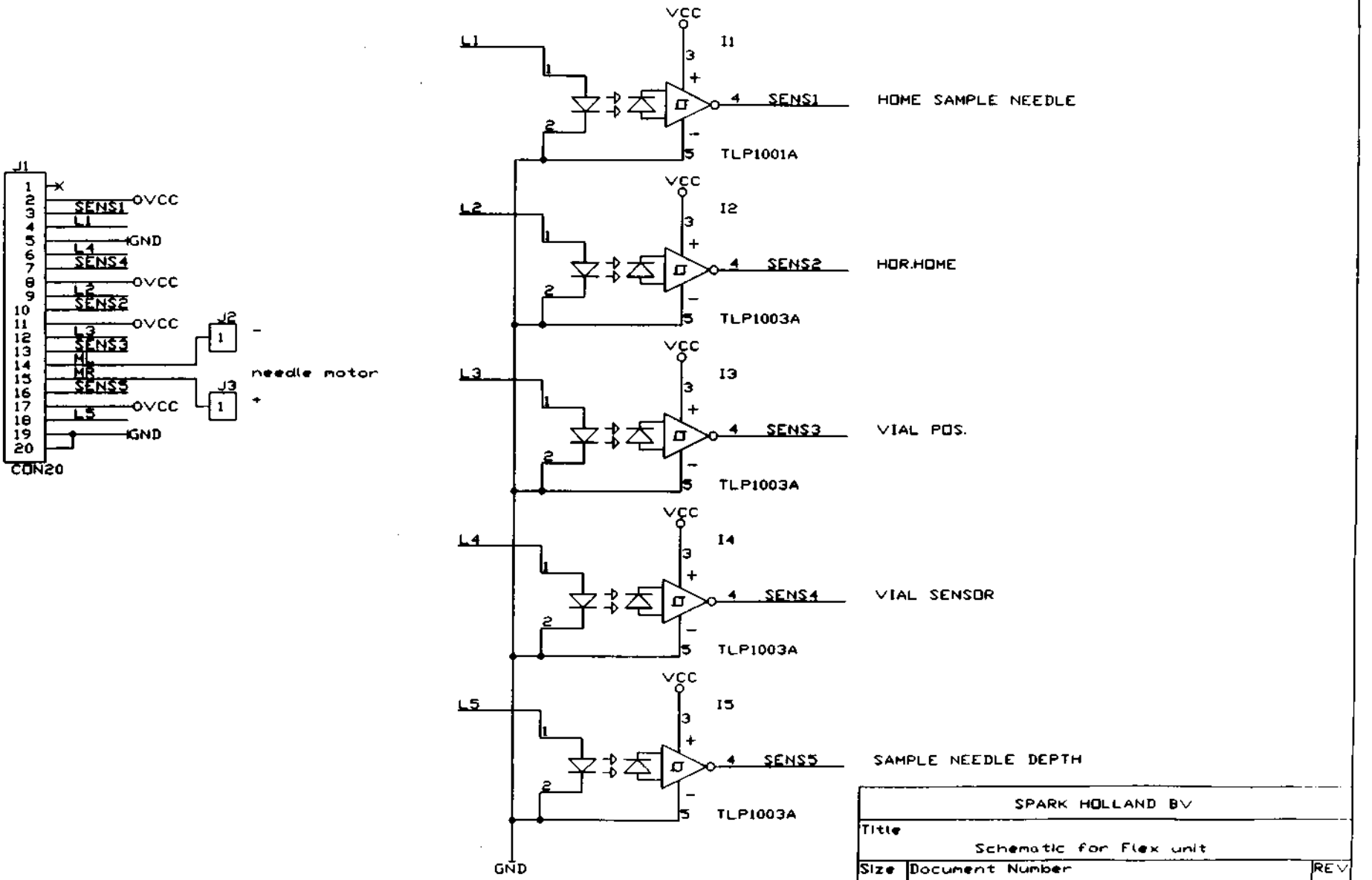
Finish.. | Ra.:

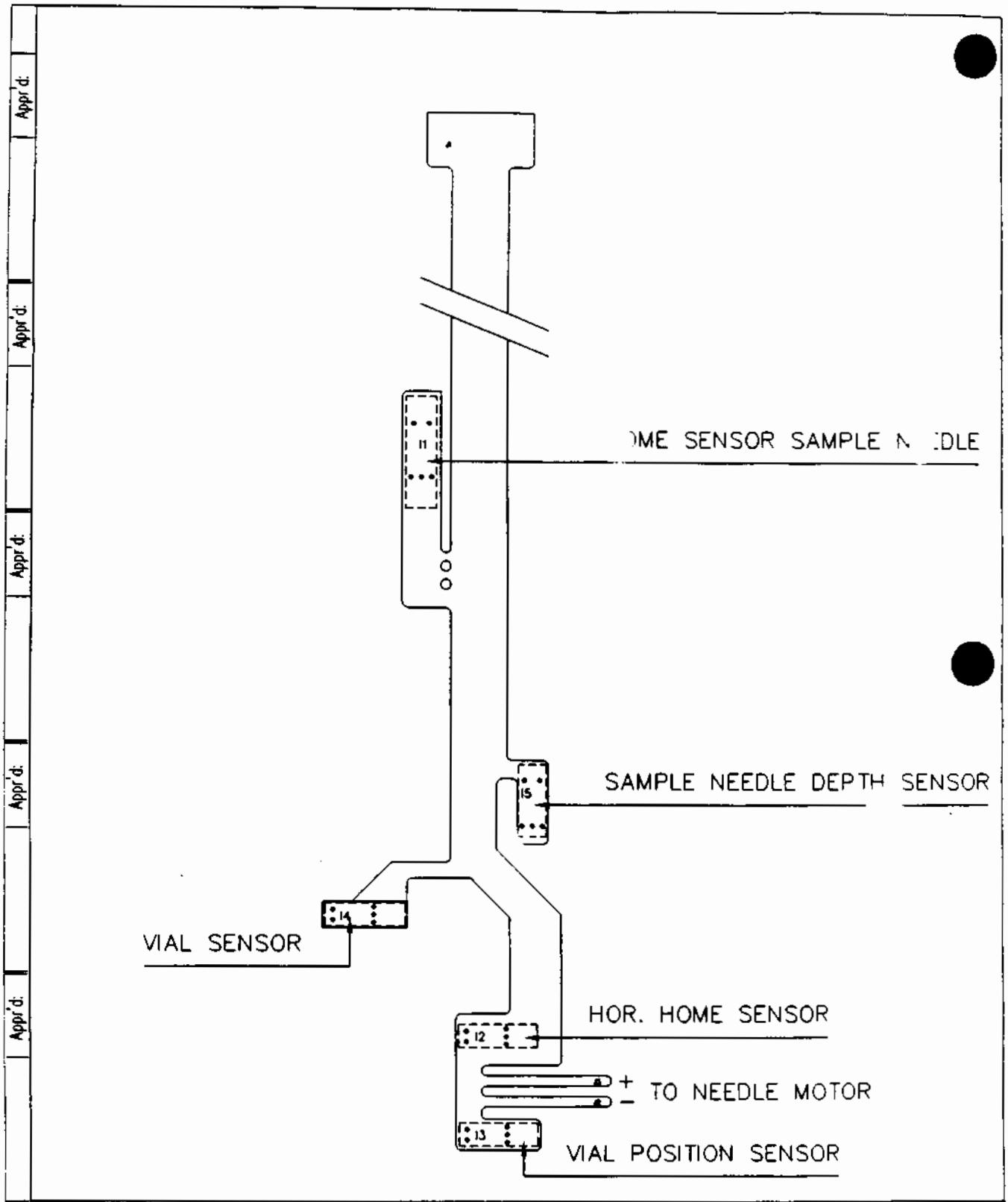
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Spark Holland
INSTRUMENTS FOR HELC

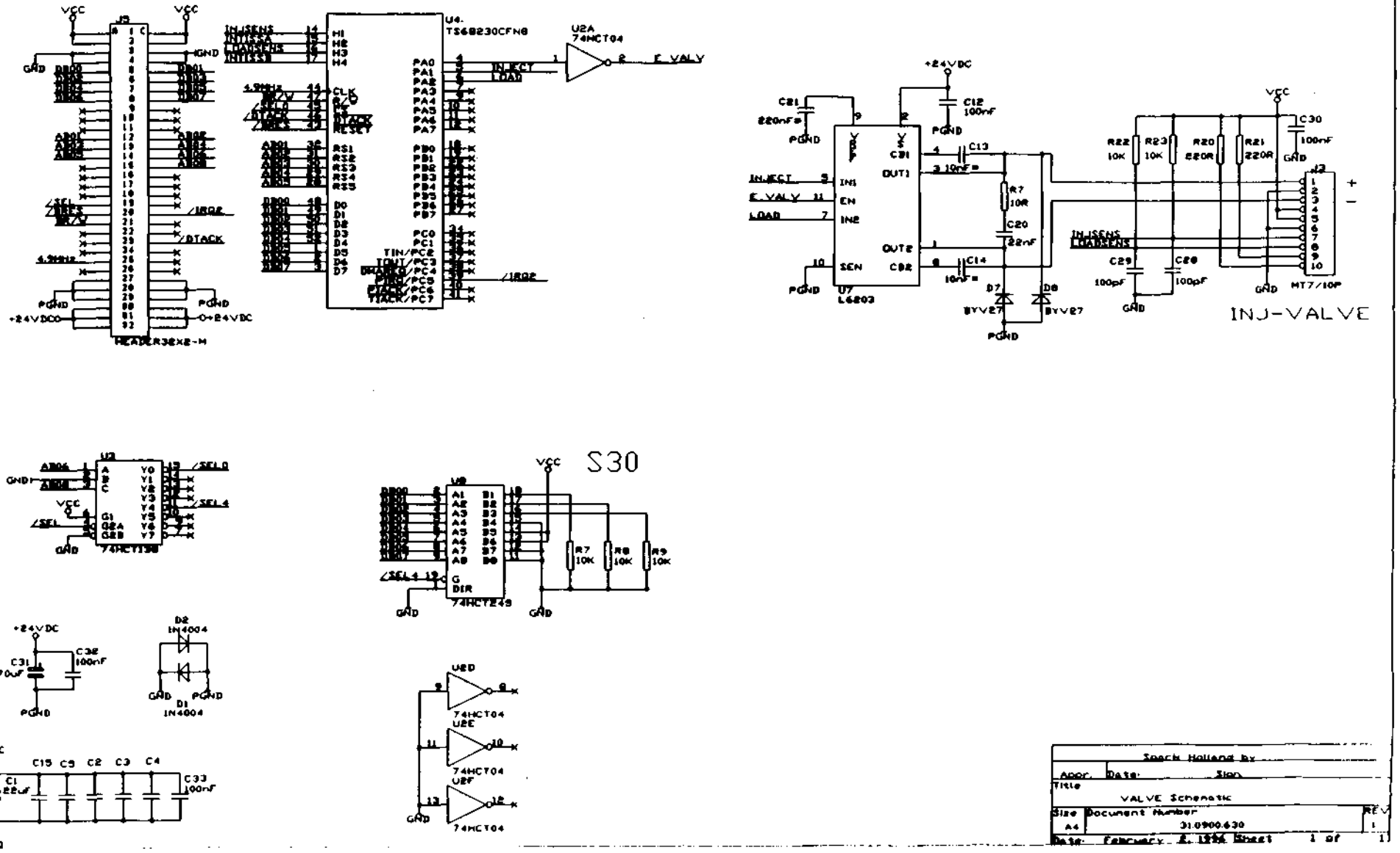
Title: NEEDLE UNIT PCB ENDURANCE

Drawn: GSC		Sheet:	Drawing nr.:	A Rev.:
Appr'd:	1st Rev.: 24-06-98	1/1	71.0920.620.4.1	
Proj.method:	Scale:			

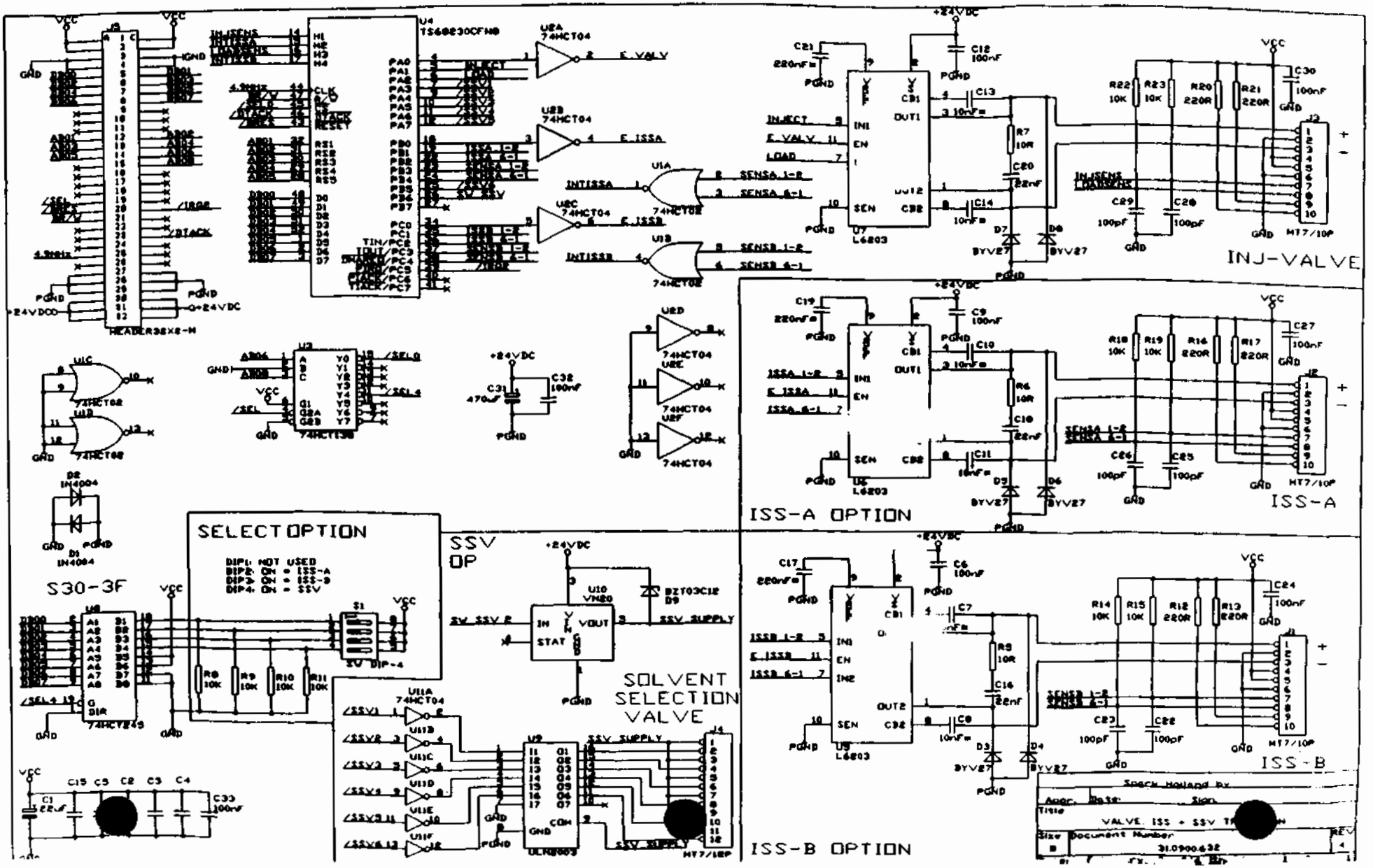

J1
CON20
SENS1
L1
GND
L4
SENS4
L2
SENS2
L3
SENS3
ML
MR
SENS5
L5
OVCC
J2
J3
needle motor
VCC
I1
I2
I3
I4
I5
TLP1001A
TLP1003A
HOME SAMPLE NEEDLE
HOR.HOME
VIAL POS.
VIAL SENSOR
SAMPLE NEEDLE DEPTH
GND
SPARK HOLLAND BV
Title
Schematic for Flex unit
Size
A4
Document Number
31.900.625
REV
2
Date: June 4, 1993 Sheet 1 of 1

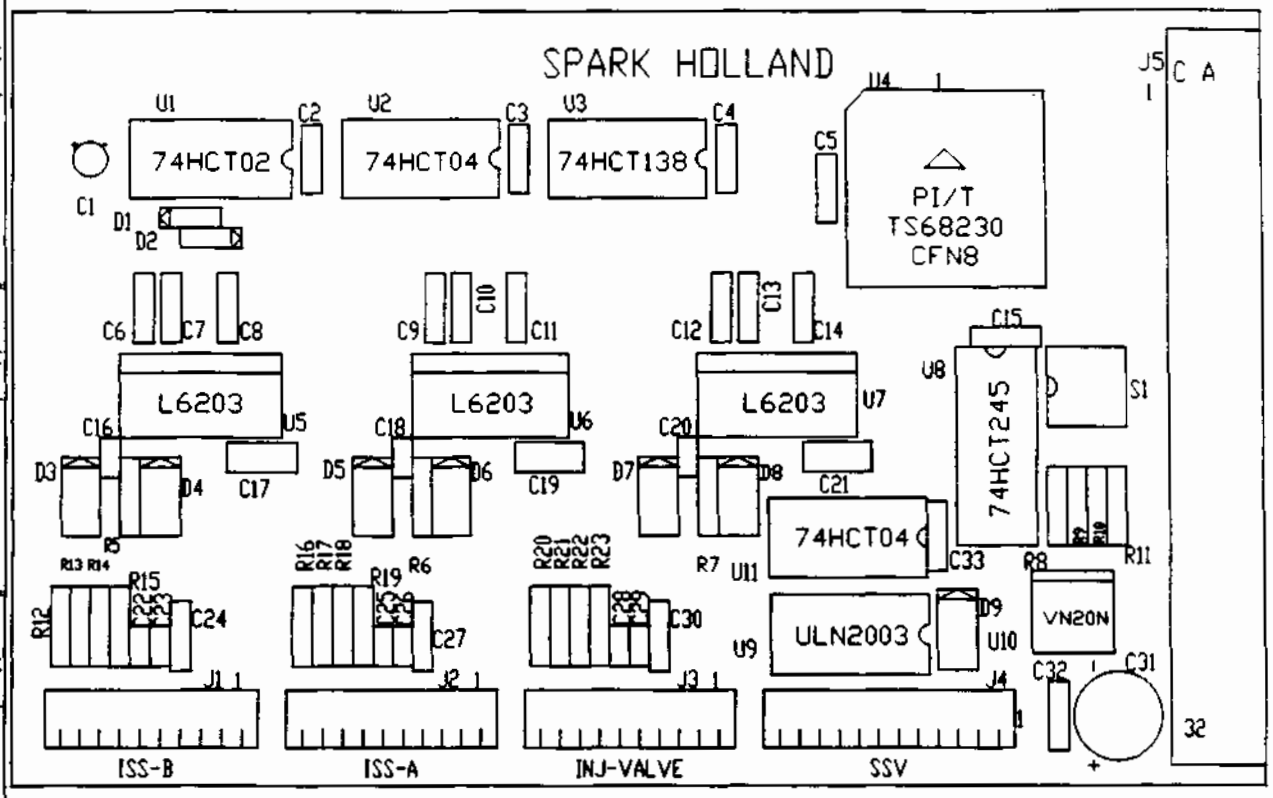


Mat.:				Toler.:	
Finish.:				Ra.:	
Copyright reserved Spark Holland b.v. Emmen The Netherlands	Title: FLEX PCB TRIATHLON				
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	Appr'd:	1st Rev.: 04-06-96	1/1	71.0900.625.4.1	
	Proj.method:	Scale: 1:1			



Enech Holland by		
Addr.	Data:	Sign
Title: VALVE Schematic		
Size: A4	Document Number: 3109900630	REV: 1
Date: February 8, 1996	Sheet 1 of 1	


INJ-VALVE
ISS-A OPTION
ISS-A
SELECT OPTION
DIP1: NOT USED
DIP2: ON = ISS-A
DIP3: ON = ISS-B
DIP4: ON = SSV
S30-3F
SSV OP
SOLVENT SELECTION VALVE
ISS-B OPTION
ISS-B
VALVE ISS + SSV



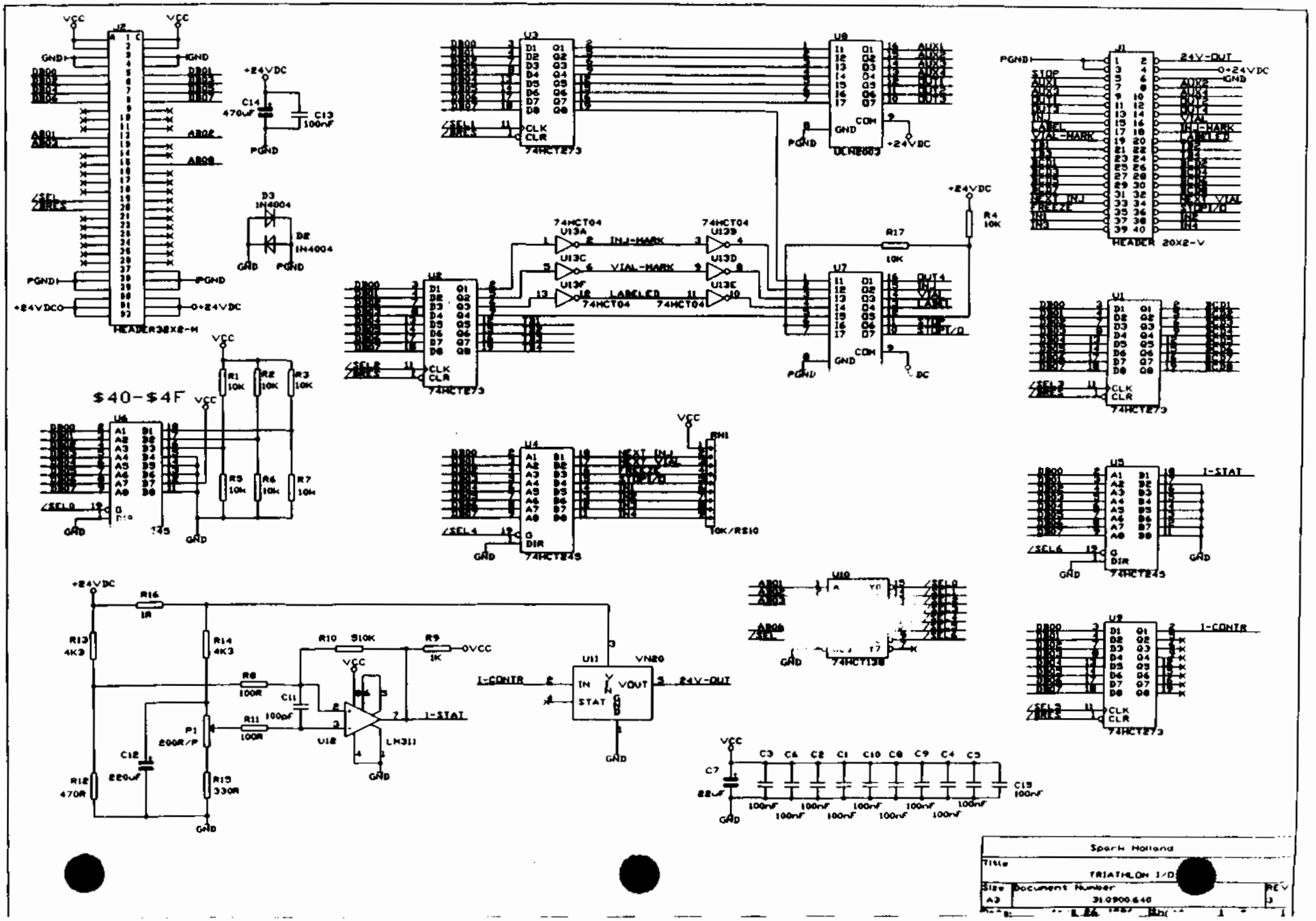
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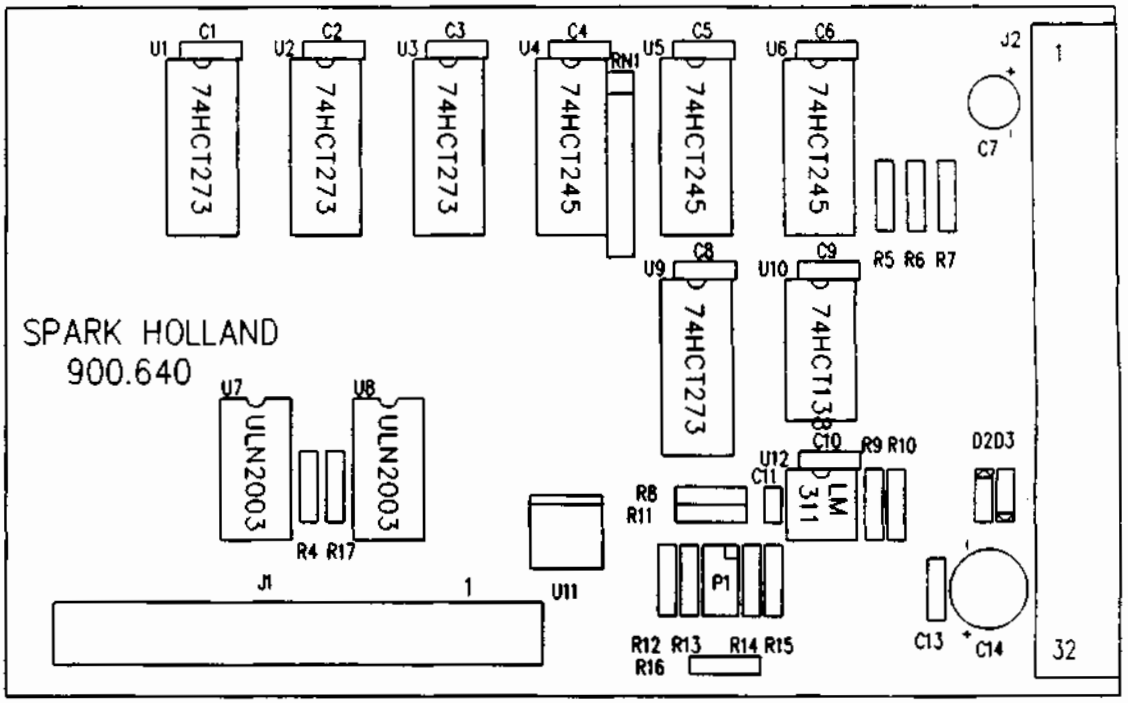
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Appr'd:

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Rev.:	Mat.:		Toler.:
	Finish.:		Ra.:
	Copyright reserved Spark Holland b.v. Emmen The Netherlands	Title: VALVE UNIT + ISS + SSV PCB	
	Spark Holland	Drawn: GSC	Sheet: Drawing nr.: A Rev.
		Appr'd: 1st Rev.:04-06-96	1/1 71.0900.632.4.1
		Projmethod: Scale: 1:1	


HEADER38X2-M
74HCT273
74HCT04
74HCT245
74HCT138
LM311
VN20
$40-$4F
1-STAT
1-CONTR
24V-OUT
HEADER 20X2-V
Spark Holland
TRIATHLON I/O
Document Number
310900640



Appr'd:

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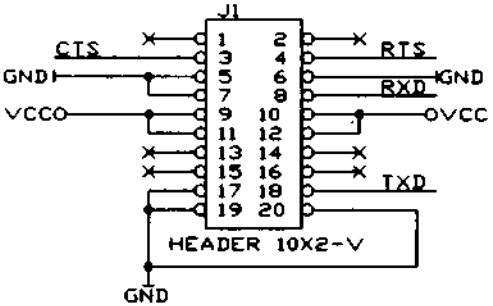
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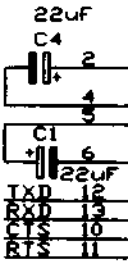
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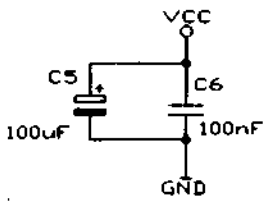
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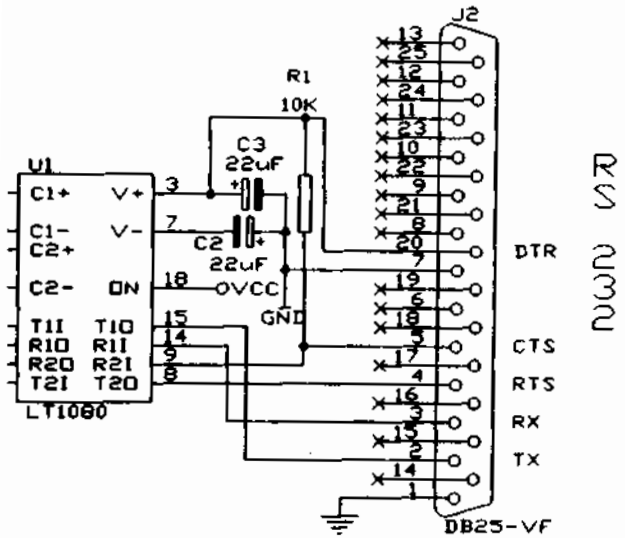
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Mat.:			Toler.:
Finish.:			Ra.:
Copyright reserved Spark Holland b.v. Emmen The Netherlands	Title: I/O PCB TRIATHLON		
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	Appr'd: 1st Rev.: 04-06-96	1/1	71.0900.640.4.1
	Proj.method: Scale: 1:1		


J1
CTS
GND
VCCO
RTS
GND
RXD
VCC
TXD
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20
HEADER 10X2-V
GND

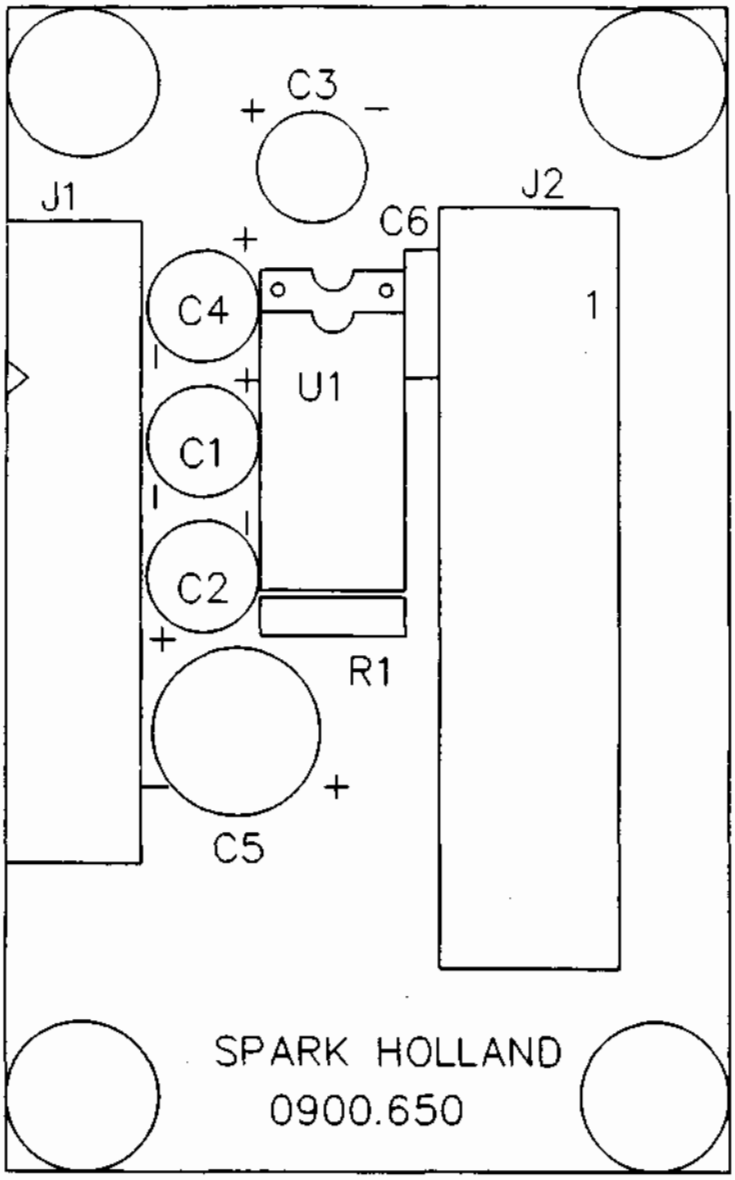

22uF
C4
2
4
5
C1
6
22uF
TXD 12
RXD 13
CTS 10
RTS 11


VCC
C5
C6
100uF
100nF
GND



DWG SR

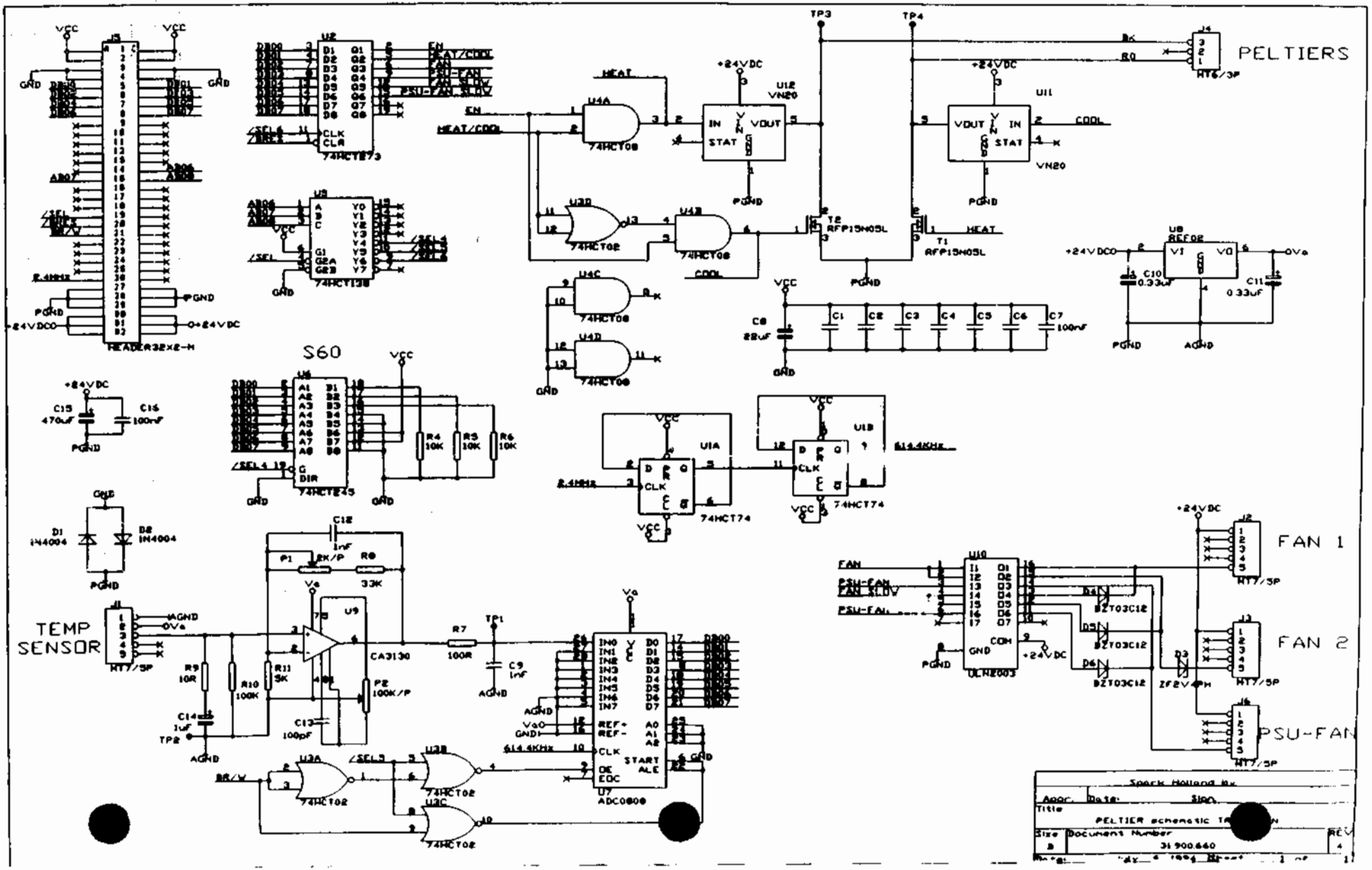
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Size: A4	Document Number: 31.900.650	REV: 1
Date: June 4, 1992	Sheet 1 of 1	

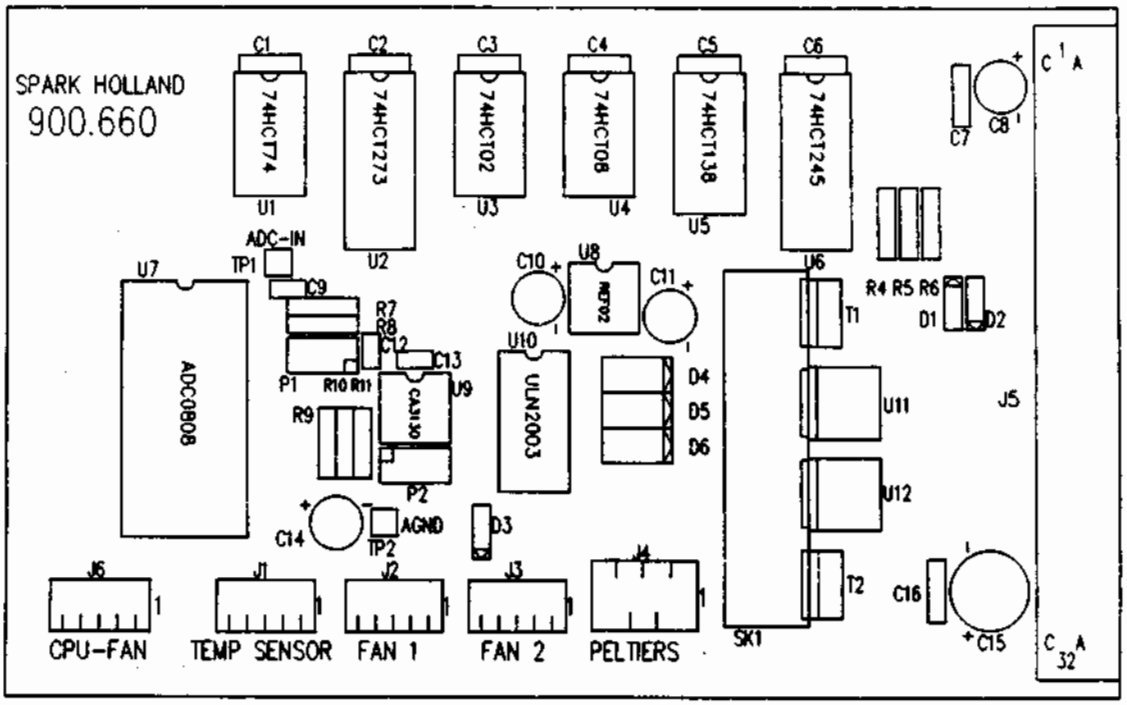


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Rev.:

Mat.:			Toler.:
Finish.:			Ra.:
Copyright reserved Spark Holland b.v. Emmen The Netherlands	Title: RS 232 INTERFACE PCB		
Spark Holland	Drawn: GSC	Sheet:	Drawing nr.: A Rev.:
	Appr'd: 1st Rev.: 04-06-96	1/1	71.0900.650.4.1
	Proj.method: Scale: 1:1		

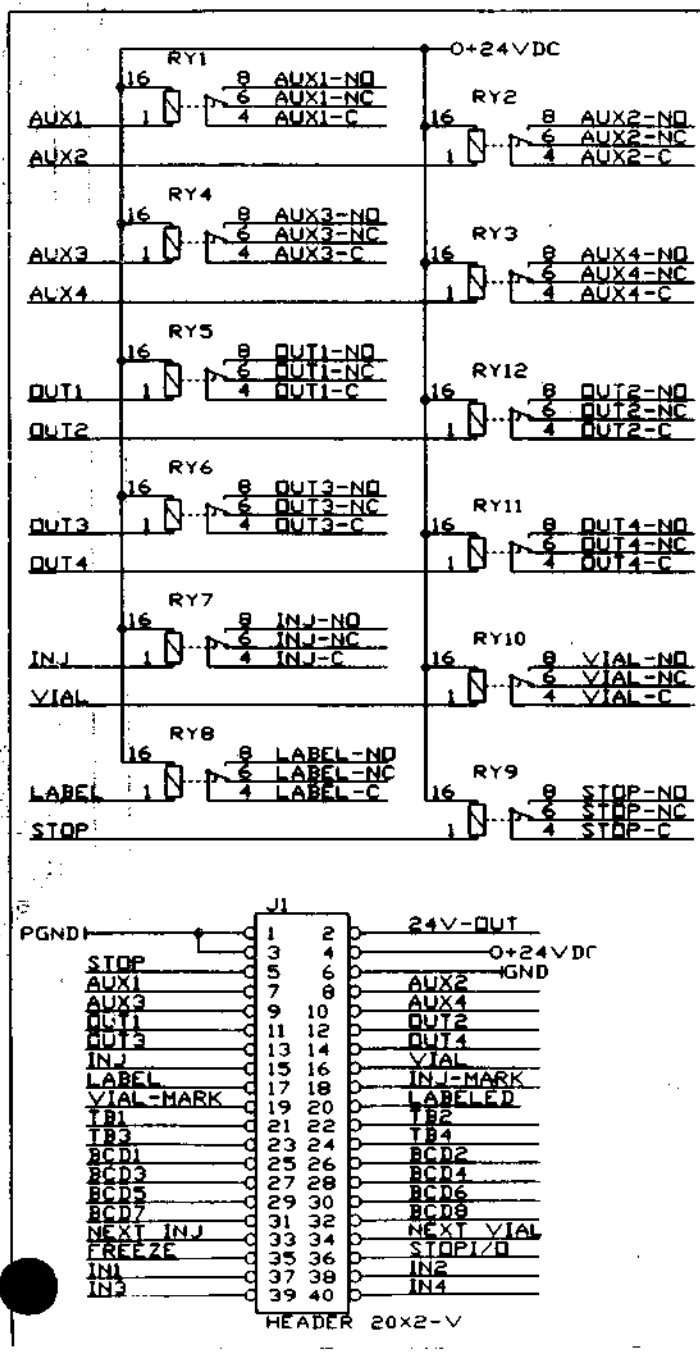

PELTIERS
FAN 1
FAN 2
PSU-FAN
TEMP SENSOR
S60
READER32X2-H
74HCT873
74HCT138
74HCT08
74HCT245
74HCT74
CA3130
ADC0808
ULN2003
VN20
RFP15N05L
REF02
Spark Holland bv
PELTIER schematic
31 900.640



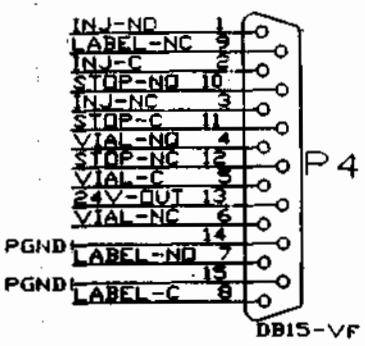
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Rev.:

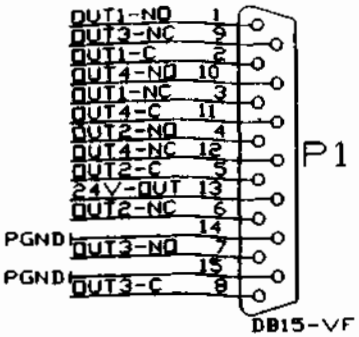
Mat.:			Toler.:
Finish.:			Ra.:
Copyright reserved Spark Holland b.v. Emmen The Netherlands	Title: PELTIER PCB TRIATHLON		
Spark Holland INSTRUMENTS FOR HPLC	Drawn: GSC	Sheet:	Drawing nr.: A Rev.:
	Appr'd: 1st Rev.: 04-06-96	1/1	71.0900.660.4.1
	Proj.method: Scale: 1:1		


RY1
RY2
RY4
RY3
RY5
RY12
RY6
RY11
RY7
RY10
RY8
RY9
0+24VDC
AUX1
AUX2
AUX3
AUX4
OUT1
OUT2
OUT3
OUT4
INJ
VIAL
LABEL
STOP
AUX1-NO
AUX1-NC
AUX1-C
AUX2-NO
AUX2-NC
AUX2-C
AUX3-NO
AUX3-NC
AUX3-C
AUX4-NO
AUX4-NC
AUX4-C
OUT1-NO
OUT1-NC
OUT1-C
OUT2-NO
OUT2-NC
OUT2-C
OUT3-NO
OUT3-NC
OUT3-C
OUT4-NO
OUT4-NC
OUT4-C
INJ-NO
INJ-NC
INJ-C
VIAL-NO
VIAL-NC
VIAL-C
LABEL-NO
LABEL-NC
LABEL-C
STOP-NO
STOP-NC
STOP-C
J1
PGND
24V-OUT
0+24VDC
GND
STOP
AUX1
AUX3
OUT1
OUT3
INJ
LABEL
VIAL-MARK
TB1
TB3
BCD1
BCD3
BCD5
BCD7
NEXT INJ
FREEZE
IN1
IN3
AUX2
AUX4
OUT2
OUT4
VIAL
INJ-MARK
LABELED
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BCD6
BCD8
NEXT VIAL
STOPI/O
IN2
IN4
HEADER 20X2-V

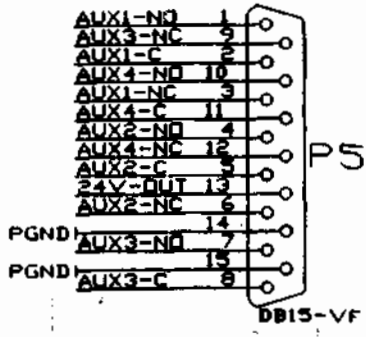
MARKERS



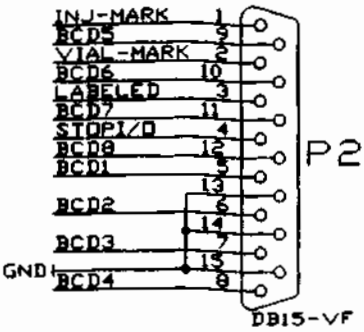
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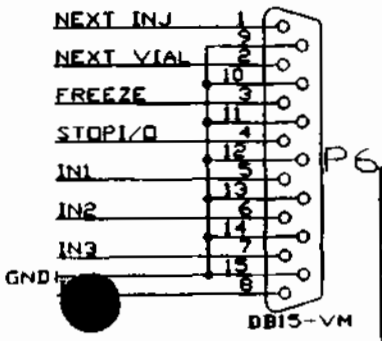
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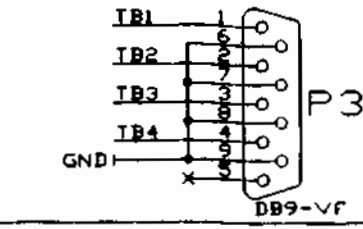
8 BIT VIALNR + MARKERS (TTL)



INPUT



4 BIT TIME BASE



Spack Holland by

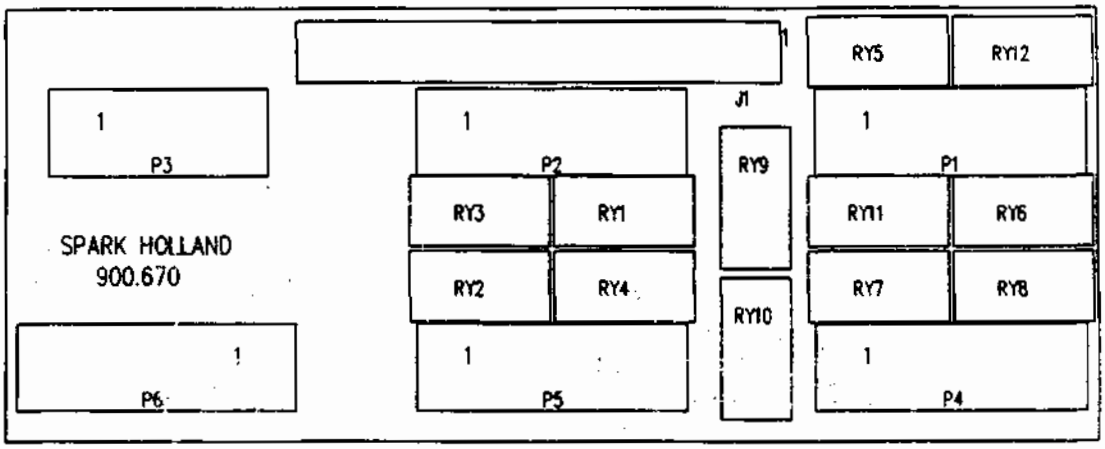
Appr. Date: Sign

Title

BACKPANEL CONNECTORS

Size	Document Number	REV
A4	31.0900.670	3

Date: May 24, 1995 Sheet 1 of 1



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Appr'd:
Appr'd:
Appr'd:
Appr'd:

Rev.:

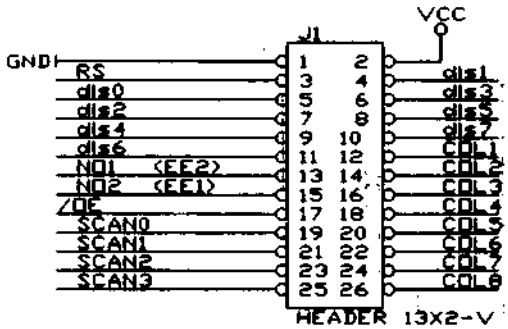
Mat.:
Toler.:
Finish.:
Ra.:

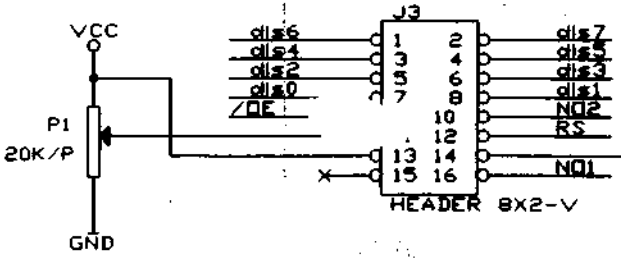
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Spark Holland b.v.
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Title: BACKP. I/O CONNECTORS PCB

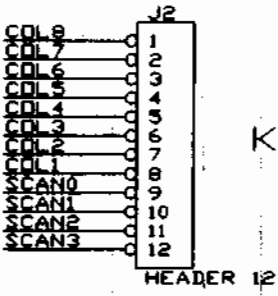
Spark Holland
INSTRUMENTS FOR HEP

Drawn: GSC
Appr'd:
Proj.method:
1st Rev.: 04-06-96
Scale: 1:1
Sheet: 1/1
Drawing nr.: 71.0900.670.4.1
A
Rev.:


VCC
J1
GND
RS
dis0
dis2
dis4
dis6
NO1 (EE2)
NO2 (EE1)
/OE
SCAN0
SCAN1
SCAN2
SCAN3
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20
21 22
23 24
25 26
dis1
dis3
dis5
dis7
COL1
COL2
COL3
COL4
COL5
COL6
COL7
COL8
HEADER 13X2-V


VCC
P1
20K/P
GND
J3
dis6
dis4
dis2
dis0
/OE
1 2
3 4
5 6
7 8
10
12
13 14
15 16
dis7
dis5
dis3
dis1
NO2
RS
NO1
HEADER 8X2-V

DISPLAY



KEYBOARD

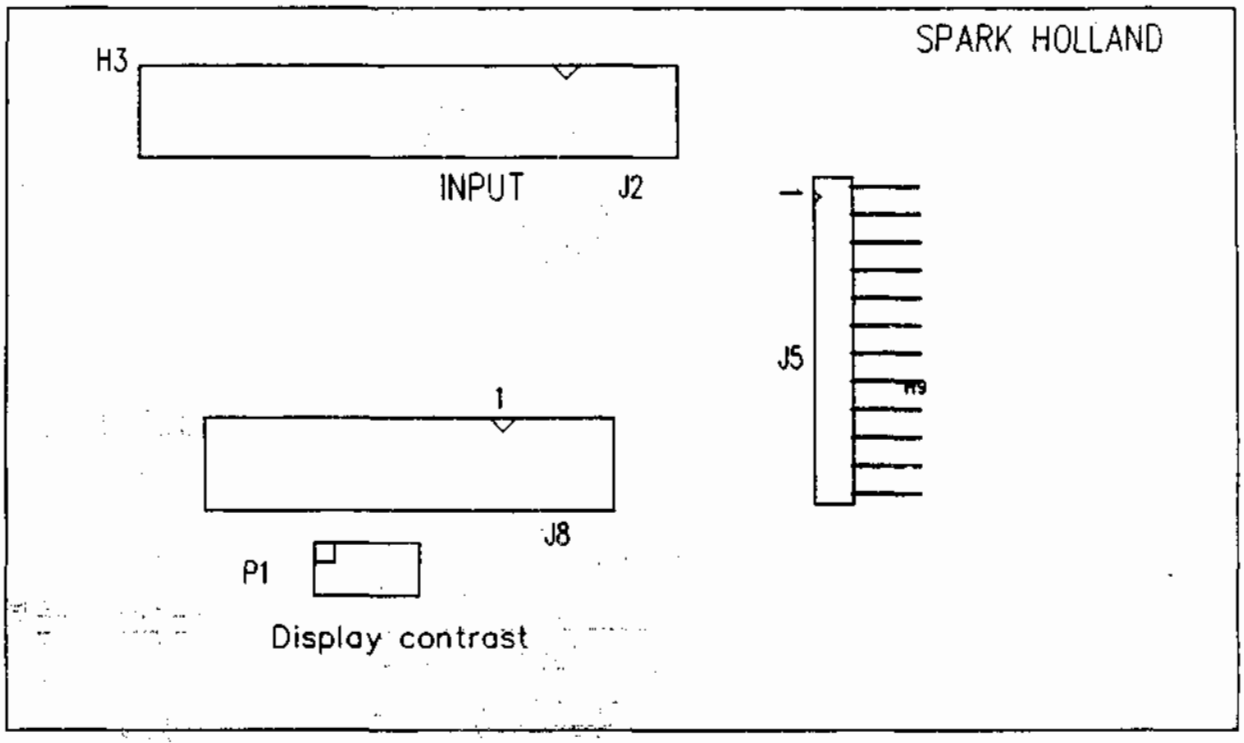
GND

SPARK HOLLAND BV

Title
KEYBOARD/DISPLAY INTERFACE

Size | Document Number 31.900 680 | REV 2

July 20, 1993 | Sheet 1 of 1

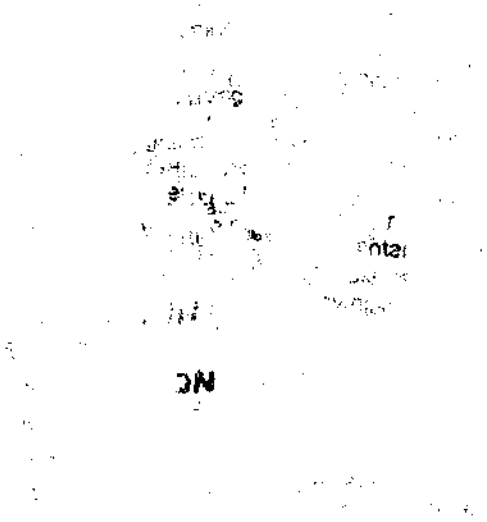


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Copyright reserved Spark Holland b.v. Emmen The Netherlands	Title: KEYB./DISP. INTERF. PCB		
Spark Holland	Drawn: GSC	Sheet:	Drawing nr.: A Rev.:
	Appr'd: 1st Rev.: 04-06-96	1/1	71.0900.680.4.1
	Proj.method: Scale: 1:1		

Please Add to PS430/AI-96

Service Manual



Service News

Service News

For Internal Use Only!

HOLLAND Spark

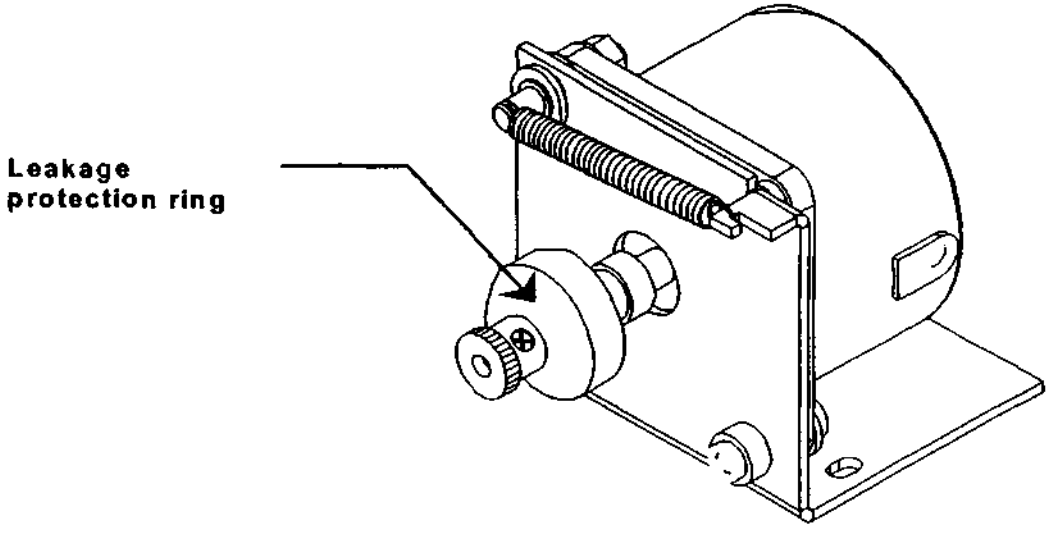
Service News

Service News No. 2003

Date: 07-01-2000

0920/0921 Endurance Autosampler

☒	**Change**	Modified leakage protection ring
☒	**Error description**	Tray steppermotor might blocked, due to extreme condensation
☐	**New Partnumber**	Partnumber remains 0043.831
☒	**Effective**	920: From serial number 920.90146 delivered in Wk 01, 2000 921: From serial number 921.90053 delivered in Wk 02, 2000
☒	**Comments:**	In case of extremely condensation water, the current leakage protection ring might be not capable to guide the leakage into the leakage basin. When the leakage comes into the tray drive steppermotor, it might block the motor, due to corrosion of the bearings. The new leakage protection ring is made larger to guide the leakage into the designed leakage basin. We recommend replacing the current leakage protection ring on instruments with a cooling option, during a PM. See the attached installation instruction for replacing the leakage protection ring.



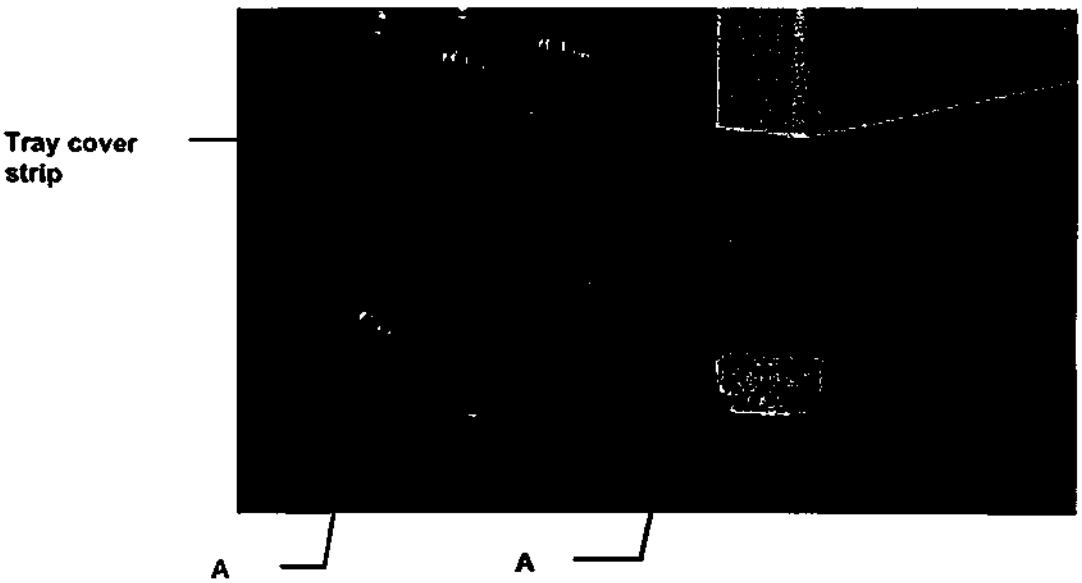
Instructions to replace leakage protection ring.

These instructions cover procedures to replace the leakage protection ring.

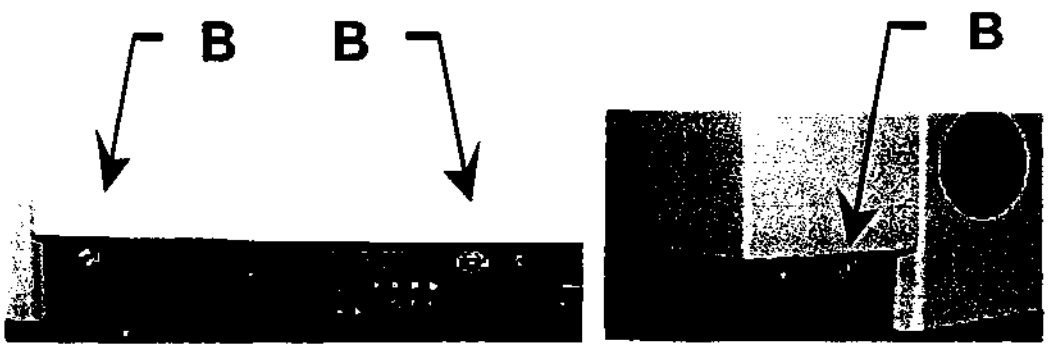


WARNING:
Disconnect Autosampler from AC power source to prevent danger of electrical shock

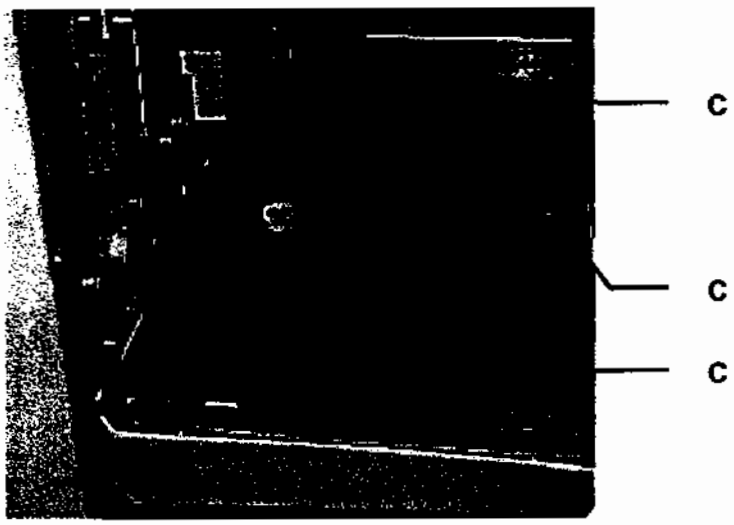
1. Remove wellplate and tray holder from the Autosampler.
2. Remove the traycover strip, by loosening the 2 hex keys marked A.



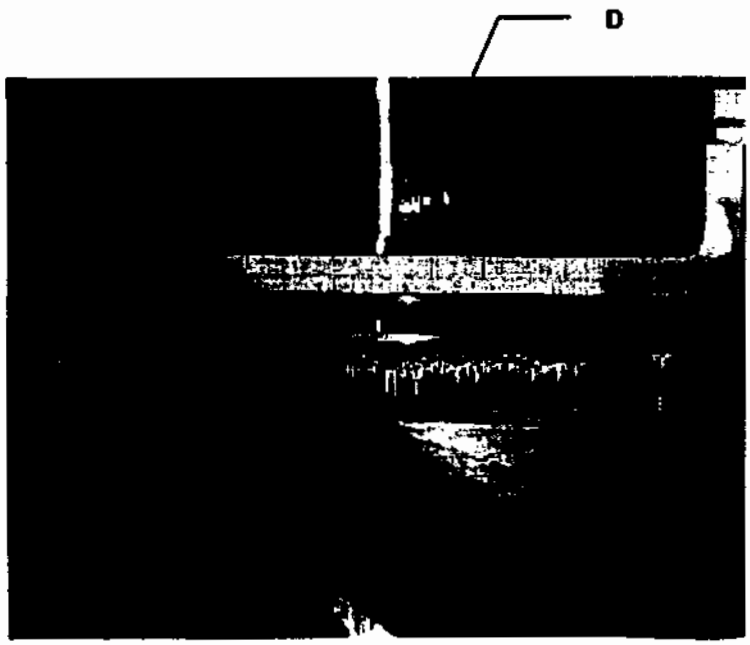
3. Remove the traycover by loosening the screws marked B.



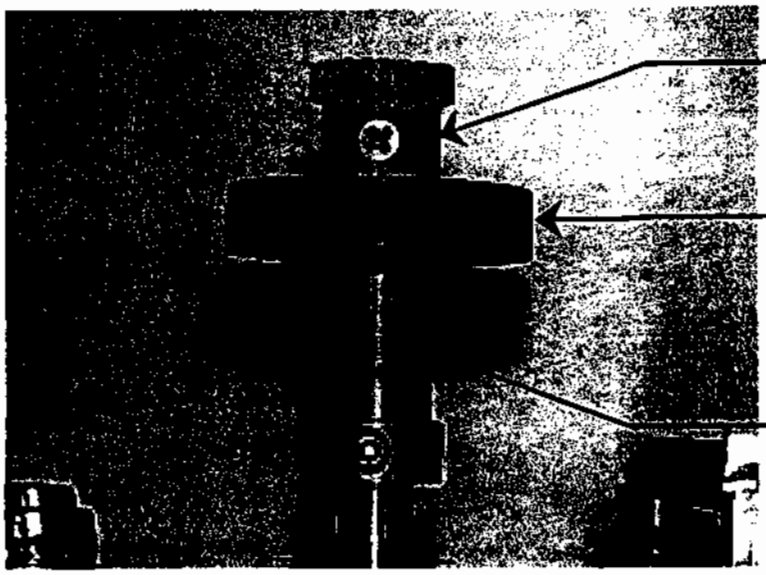
4. Remove the cooling plate by loosening the screws marked C.



5. Remove the screw marked D, which holds the extension shaft on the tray motor.



6. Remove the extension shaft and replace the leakage protection ring with the modified ring.



7. Reinstall the extension shaft on the tray axle. Keep the screw D loosened
8. Reinstall the cooling plate and the drain tubing.
9. Tighten the screw D off the extension shaft.
10. Reinstall the traycover and traycover strip.
11. Reinstall the tray holder and wellplate and reconnect the Autosampler to the AC power source.

NOTE:
For Instruments with feeder options, it might be necessary to slide the feeder option forwards, before removing the cooling plate.
Readjust the feeder option to its original position after all steps are performed.

See procedure in the Service Manual

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